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Contributions.

Earth Tremors Caused by Moving Trains.

MAY 12, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Working in connection with Albion College Astronomical Observatory, I have for some time had rather unusual opportunities for observing the earth tremors set up by a moving train. The Michigan Central track passes the observatory at a distance of about 600 ft., and whenever a train passes earth vibrations are set up to such an extent as to make accurate observations with the telescope impossible.

The telescope, which has an 8-in. aperture, rests at a height of about 20 ft. above ground on a stone pier, which is built up for several feet (I do not know the exact distance) under ground. There is also an open space around the pier from top to bottom; this construction being expressly intended to avoid the effect of earth vibrations, which it completely fails to do.

The railroad station is about one-fourth mile distant, and when a train leaves the station the image in the telescope begins to vibrate, the disturbance increasing very rapidly till the train is opposite the observatory and then slowly dying away. During all this time, an interval of from one to three minutes, accurate observation is impossible. For ordinary observations of the moon and planets magnifying powers of from 90 to 300 are used, and of course the effect of the vibration is magnified an equal number of times, as seen through the telescope, projected on the field of view.

The extent of the vibrations is remarkable, considering the distance from the track and the depth to which the pier is set, for it is usually supposed that such vibrations, whatever their surface intensity extend but a few feet underground.

Although the intensity of vibration necessary to cause a blurring of the image in the telescope is very slight it will be seen to what extent they must be set up by the train, when we consider that since they are propagated in all directions their intensity must decrease inversely as the square of the distance from the train; calling the intensity at one foot from the track unity, the intensity at a distance of 10 ft. would be but $\frac{1}{100}$ of what it is at the track and at a distance of 600 ft., as in the present case, the intensity would be diminished 600² or 360,000 times. It is absolutely impossible to make an estimate of how much energy is consumed in setting up these vibrations, but it must be a considerable amount. It occurs to me that no small part of what is usually termed atmospheric resistance, may be due to energy wasted in earth vibrations. It is remarkable that both vary in the same way, that is, as the product of the mass and square of the velocity of the train; for it is evident that the amount of vibration set up would be proportional to the energy of the train for which the above is an expression as it is also for the atmospheric resistance as usually given.

R. E. HORTON.

Rapid Transit for New York.

BROOKLYN, May 23, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The decision of the Appellate Division of the Supreme Court failing to confirm the selection of routes for the new Rapid Transit lines, will in all probability end the long and tedious efforts of the Commission to provide an underground railroad for New York City. The amendments adopted by the legislature at the instance of the Commission made it certain that if the railroad was built at all, it would be built by one or other of the

trunk lines and made a city terminal of these lines. This is probably the only way in which an underground road can be built and successfully operated and we shall get it in this way, if ever.

Possibly the Commission will now modify its plan and come down town below Fourteenth Street on two lines, east and west of Broadway, which it should have done at the first, for the safety and convenience of the public; but this will only protract the agony and the people will be better pleased if the matter is dropped at once and the next legislature repeals the rapid transit legislation of 1890, and later on substitutes something entirely different. As it is now, the Commission has come to be a hindrance rather than a help to rapid transit.

The writer said in 1869 that the elevated railroads, then just commenced, would serve a useful purpose in bridging over the time until something better could be obtained. Your position has always been a wise one, that the elevated roads have not outlived their usefulness, but that better accommodation than we have ever had can be got by judicious addition and improvement. The improved surface lines and an efficient system of elevated lines will give New York City excellent facilities for 5 or 10 years to come. The northern city is now well served by two or three steam surface lines, and is certain of much better service from improved elevated lines.

It would, in a sense, be almost criminal to force an expensive underground system on us at a time when the city is to be greatly enlarged and redistributed. New bridges will soon span the East River, and the entire problem of distribution of population will be radically changed within the next 10 years. Only when that new distribution has indicated its direction and intensity can new and serviceable lines of permanent construction be satisfactorily located and built.

A cursory glance at the map of the "Greater New York" shows that the most attention should be given and the most money be spent in making it possible for the great mass of people who do business on the island of New York to cross the East River. More people will soon cross the North River to New Jersey than now go to Brooklyn, unless better opportunities are given for reaching the healthy, comfortable and cheaper residential districts of Long Island.

It is fortunate that the courts have virtually vetoed the underground project; the money it would cost should be reserved for expenditures on bridges over the East River and much time and profoundest study should be given to the great problem of city transit; so that we may, in the end, have a grand system which could not be entirely blocked, as in the stem line on Broadway, by a single accident, and one which does not terminate, as does this one, in a *cul de sac*, below water at the Battery.

METROPOLITAN.

Dirt Burners on Passenger Trains.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The cinders sifted into the car in such quantity, the other day as I was traveling on a certain New England railroad, that I was constrained, at the next station, to walk forward to the engine and look at the coal. It is not the first time I have been impelled to make this melancholy investigation, and, as in previous cases, I found that the tender was banked up with soft coal dust, through which a few lorn lumps were poking their desolate noses. It was the sort of coal which is bought as "run of mine," but which lapses into dustier dirt with every handling. If my guess is right this coal had a constitutional tendency to disintegration when it was mined, a tendency which had been fostered by handling the coal four or five times, and roughly at that.

A fireman of my acquaintance, who occasionally has to use such coal, objects to it very strongly, though he gets it dumped into his tank direct from the mine car. "It's no good," says he; "it goes through the flues without touching the fire. When I wet down my coal the cinders come wet out of the stack."

As I went back to my seat, I sighed to think that this particular road was so far from the mines that it could not afford good coal, and recalled the comfort of my trip of a few days before over a road in the soft coal region behind a locomotive which was fed with beautiful shining lumps of gas coal which had to be broken with a pick, they were so large, and which made no more cinders than does anthracite. I thought so much, indeed, on this subject, that I pulled out my pencil and made a few figures to see why the New England road could not afford good coal, when, to my surprise, the calculation came out the wrong way!

Here are my figures: they are high, but I don't think my percentages are far out. My coal road buys "run of mine" coal for freight service, say at \$1 a ton. For passenger service it buys screened gas coal at say \$1.30. The gas coal does perhaps 10 per cent. more work than the "run of mine"; allowing for this, our coal road pays 20 per cent. extra on its passenger coal to secure its passengers' comfort.

Now how is it with this New England road which has to pay, say, \$3 a ton freight on its coal? It pays \$1 plus \$3; that is, \$4 a ton for coal dust, when it could buy screened gas coal for \$4.30; an additional expense, mark you, of only $\frac{7}{10}$ per cent. That is, my New England road saves $\frac{7}{10}$ per cent. on its coal without regard to the comfort of its passengers, and further without regard to the fact that it has to buy 10 per cent. more poor coal than it would have to buy of good.

It therefore occurs to me that the railroads at a dis-

tance from coal mines may not know what good coal is. I cannot in any other way explain their buying the poor stuff that I see used in their engines when I remember that the freight is no more on good coal than on bad. If this fact were fully considered it would seem that the roads furthest from the mines can best afford the best coal. If this fact could be thoroughly appreciated it would make railway travel in New England pleasanter and the running of railroads more profitable. T. C.

[We are reluctant to believe that the manager of the railroad referred to has never seen good coal. We presume that he takes his private car and makes a trip over the Pennsylvania or the Lehigh Valley every year or two, or oftener. Possibly his persistence in using poor coal is explainable on some other theory. Perhaps the passengers who ride over his road are in the subdued condition of the stockholders of the A. B. C. railroad (a line in that region) a few years ago. The President of the road, being threatened with aggressive measures by the X. Y. Z. road in a rate war, retorted that he was prepared to carry freight at cost for an indefinite time, a policy which he felt sure the X. Y. Z. would not have the nerve to follow. "But," answered the President of the X. Y. Z., "your stockholders may have something to say on that subject." "Oh, that's all right," said Mr. A. B. C.; "my stockholders have got along without dividends for the last nine years, and they have got used to it."—EDITOR RAILROAD GAZETTE.]

Improvement of Station Service.*

Mr. Haff confined himself to small and medium-sized stations, and, while treating the subject in a general way, gave a practical turn to his utterances by making them largely statements of his own experience. Mr. Haff's position is a new one, created only three years ago, and there are not many roads which have an office precisely like this. A chief of station service, ranking the same as a chief of train service, was recommended by Colonel Haines in his address on railroad operation before the American Railway Association last October. Mr. Haff mentions as one of the principal reasons for having a superintendent of stations the fact that the division superintendent has to give such a large portion of his time to the train service. The station service, embracing the men who come most directly into contact with the public, and thus very directly affecting the reputation and prosperity of the road, is of sufficient importance to demand the supervision of a man who shall make this his chief work.

The Superintendent of Station Service should have a district sufficiently limited to enable him to spend most of his time on the road, not being burdened with clerical work; he should acquire a close personal knowledge of the individual qualifications and character of each agent. He should intelligently consider the character and location of station buildings, and always advise with the building department when new stations are established or changes made. From carelessness in this respect some roads have wasted the services of one man by locating the freight house too far from the passenger house.

Mr. Haff gave a forcible description of the varied qualifications required of a station agent, and emphasized the importance of good judgment in the selection of new men. Ability to telegraph is valuable not only at small stations, but at the larger ones, where the agent, if he is an operator, can more efficiently supervise the operators under him. In the matter of affability in dealing with unreasonable customers Mr. Haff never takes no for an answer; that is, he never accepts the plea that it is impossible to deal with such customers without losing one's temper. Systematic inspection is of the highest importance, and visits should be made as often as possible, even every day. Where agents understand that such visits will be made without notice, a spirit of emulation is aroused, and many of them come to look forward to the visit of the Inspector with pleasure instead of dread. The Inspector will generally find a local freight the most convenient means of reaching the stations. Where the inspector's territory is too large and he cannot get it reduced he can sometimes delegate a part of his work to an efficient station agent, having him visit those less efficient than himself.

Mr. Haff reminds station agents that those who are the most systematic and orderly are always first thought of when a vacancy occurs in the higher ranks, and he reminds superintendents not to do injustice to an efficient agent by leaving him where he is, because he is efficient.

DISCUSSION.

Mr. TODD (West Shore) spoke of the importance of neatness. Many roads still tolerate a very untidy lot of advertisements on the walls of waiting rooms. This is entirely unnecessary, and even the interstate tariffs may now be placed inside the office as the Interstate Commerce Commission is satisfied with a framed notice announcing that tariffs can be seen upon application to the agent. Mr. Todd spoke of the great differences in agents. One will promptly telegraph to headquarters when he loses a little freight, while in another case which he mentioned a shipper took his freight to another road for six weeks before the agent missed it.

* Abstract of paper by Frank E. Haff, Superintendent of Stations, Long Island Railroad, read before the New York Railroad Club, April 16, 1896.

The alert agent promptly informs the Division Freight Agent of even the smallest rumor which may affect the business of the company. Division Superintendents are often lenient with agents who are inefficient in the traffic department, because they are valuable as telegraph operators. This is a mistake. Mr. Todd commended the action of Vice-President Harahan, of the Illinois Central, in advising station agents to take an interest in the public affairs of their town or village. This not only strengthens the company's influence, but improves the station agent by making him feel that he is of some importance.

Mr. BERG (L. V.) spoke of the importance of keeping grounds in a tidy condition. One of the worst delinquencies of agents is in the care of the toilet rooms, which rooms are often improperly used as a storehouse for mops, brooms and coal hods. He emphasized the desirability of making the Station Inspector subordinate to the Division Superintendent, for the reason that the latter officer should have active charge of everything on his division. The Station Inspector is necessary, because the practice of making Division Superintendents deal with a great multiplicity of petty details is one of the most noticeable defects in railroad organization to day. This wearing work takes the energy out of the best railroad man.

A member having spoken of the nuisance of loafers at country stations, Mr. Casey (Erie) advocated the one-room station. Sometimes the trouble is that the loafers are out of sight where they cannot be watched.

Mr. CUMMIN (Long Island) said that two-room stations had been done away with on his road, and smoking is not allowed inside the stations; sheds are provided outside.

Mr. VREELAND said that when he was on the Long Island road several years ago one of the principal difficulties was in keeping the station agents at their posts when the weather was good for blue-fishing or clam digging. (It was subsequently stated that this defect had been corrected.) Mr. Vreeland thought that the station service could be greatly improved by paying a little better wages.

Mr. MOLINEUX (L. V.) spoke of the desirability that an agent should always announce the destination of trains for the benefit of passengers. They should also take enough interest in the comfort of passengers to learn the facts about delayed trains in ample season to answer inquiries without delay.

Mr. MCCOY (N. Y. C. & H. R.): The deportment of an agent is an index to his whole character. If you get a man of clean character and good deportment details will take care of themselves. I have always found that I could get along very well without a station superintendent; to appoint such an official is simply making a place for someone.

Mr. TRATMAN advocated higher platforms. He went on to speak of all of the duties of a station agent, including the creation and care of flower gardens. A small plot of turf neatly kept, gravel pathways or a creeping plant will often greatly add to the attractiveness of a station. Rewards, either in money or privileges, are a great aid in holding station agents to their duty in the matter of cleanliness and neatness of appearance. The speaker thought that American railroads ought to have more station porters like England; and he thought that the uniformed attendants at the Grand Central Station, New York City, did not amount to much.

Mr. BERG (L. V.) spoke strongly in favor of a regular station superintendent or inspector. The Division Superintendent cannot adequately attend to this detail. A Division Superintendent of his acquaintance recently spent an entire week practically outside his territory, although he was attending pretty strictly to his duties. One day he was in court as a witness; the next he went on a right-of-way expedition to ascertain the value of some land; the next day he was lent to another company as an expert railroad man to give testimony, and the next he inspected a piece of new railroad.

Mr. MCCOY, referring again to the duties of different officers on a division, asked what the Trainmaster and Assistant Division Superintendent were to do if there was a Superintendent of Stations. He had found no trouble in personally visiting his stations as often as he believed necessary, and had visited 100 signal towers besides. It is not necessary to examine every nook and corner every day. A single visit at night at one station will put men on the alert at all the stations for six months.

Mr. HAFF: The platforms at all stations on the Long Island road have been carefully examined and the lighting arrangements revised and improved. It is now believed that no passenger will get hurt at these stations. Mr. Haff does much of his inspecting at night and the maintenance of lamps is kept at a high standard. He permits no promiscuous advertising, a large blackboard being provided at each station. The small stations have closets outside, which are kept locked, a sign being placed on the door reading "Key with Agent." No loafing is allowed around the stations. Requisitions for supplies are carefully watched. The quantity of coal and of oil needed at each station is calculated down to a fine point, the size of the lamps and the number of hours they burn being taken into consideration. Chloride of lime is freely used as a disinfectant. Salaries are increased, if necessary, to maintain the prescribed standard, and the men know that their pay depends upon the quality and quantity of the service they render.

Mr. WHEATLY (West Shore) spoke of various improvements needed at large or terminal stations, his principal

point being the importance of improved administrative measures to prevent delay and congestion of cars and freight in busy seasons.

The Hardie Compressed Air Motor for Street Cars.

The General Compressed Air Company, with General Herman Haupt, President, and Robert Hardie, Chief Engineer, has brought out a compact and complete motor for street railroad work and has licensed the American Air Power Co., of 160 Broadway, New York, of which E. A. Willard is President and E. E. Pettie, Engineer, to equip and operate cars. We are indebted to these gentlemen for drawings and for many courtesies while examining the motor.

Fig. 1 shows car 107 as it appeared on the tracks of the New York Central Railroad at Rome, N. Y., on May 8, except that the machinery was hid from view by a guard which is held up in the cut. The cars resemble the Broadway cable cars, are 28 ft. long over all and weigh about 18,000 lbs. with the mechanism. These cars are easily managed, start and stop without a jerk, are free from any hissing noise and designed to run at the rate of 12 miles per hour, but have traveled over 30 miles an hour by an actual test made by running from Rome to Oriskany. The car body is supported on elliptical springs, Fig. 2, resting on the truck frame. The diameter of the car wheels is 26 in., thus bringing the floor of the car within 34 in. of the ground.

Air Reservoirs.—There are in all 16 air reservoirs, having a total capacity of 51 cu. ft. and weighing 4,340

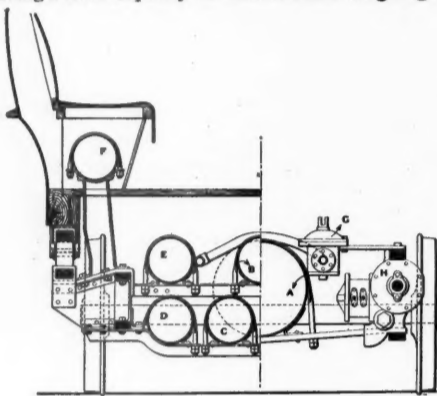


Fig. 3.

lbs. The general arrangement of five of these will be seen as B, C, D, E and F in the left-hand section view of Fig. 3. All of them rest on a framework of locomotive construction, supported on the usual type of locomotive springs. There is one under each seat, Figs. 2 and 3, running the entire length of the car. These tanks are tested to a pressure of 4,860 lbs. to a square inch within the elastic limit before they are sent to this country by the German Government inspectors.

The Heater.—The heater which is used to warm the air before entering the cylinder to drive the car is seen in a half section view as A, Fig. 3. It is 7 ft. long and 18 in. in diameter and is filled about one-half full of water through which the air is made to pass. As the object of heating the air may not be understood by our readers we will attempt to state it clearly as follows: An air motor is simply a reversed air compressor. In compressing air, work is done upon it, thereby heating it, and for the sake of economy this heat is necessarily dissipated

To obtain a high temperature in the heater through which the air passes, steam is admitted into the water, giving up its total heat; that is, the sum of the latent and sensible heat. Thus, water heated from 60 deg. F. to 212 deg. F., and then converted into steam at atmospheric pressure, would take $212 - 60 = 152$ heat units, which equals the sensible heat; plus 966 heat units, which equals the latent heat of evaporation. $152 + 966 = 1,118$ heat units, of which a large percentage is used in reheating the air. This heat reappears as work in the cylinder and increases the efficiency, as will be seen from the following figures: 98,000 heat units were taken out in reheating the air during a certain test. One pound of coal contains from 10,000 to 15,000 heat units, of which about 8,000 are available; $98,000 \div 8,000 = 12\frac{1}{4}$

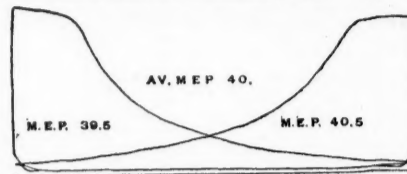


Fig. 4.

lbs. of coal to produce the 98,000 heat units, and at a cost of reheating equal to $\frac{1}{12\frac{1}{4}}$ of the cost of the coal at the compressor.* The temperature of the water at the beginning of a run ranges from 300 deg. to 325 deg., and the final temperature is from 160 deg. to 190 deg. F.

The Engines.—There are two engines, one on each side of the car, H, Figs. 2 and 3, having a diameter of 7 in. and a stroke of 14 in., the cross-head of which is connected with the rod P which, in the improved form, joins directly to the same pin as the one which connects the two driving wheels, as in Fig. 1.

The valve-gear is of a novel construction. There is a regular Stevenson's link with a fixed cut-off (from $\frac{1}{2}$ to $\frac{3}{4}$), operated by separate eccentrics and a variation of cut-off is effected by the reversing link, but in the reverse order from an ordinary locomotive. In other words, the earliest cut-off is obtained when the reversing lever is "down in the corner," at which time it will be exhausting freely, the admission valve being at its full travel. In the later cut-off the reversing lever is "cut back." Thus the motor is started several notches "cut back" from the corner, and when the train is under way the reversing lever is again put "down the corner." Fig. 4 shows the indicator cards taken from one of the engines.

Air-Brakes.—The brake L, Fig. 2, is applied by a movement of a small handle corresponding to that of the engineer's valve, at either end of the motor car, N, Fig. 2, and is instantly released by turning the handle to its center position, not waiting until the air bleeds from the cylinder. So that by a single wrist movement the car is under perfect control of the motorman.

In applying the brakes, air is admitted to the annular space around the rod, R, Fig. 5, and to release, the same air is made to pass to the other side of the piston from T around through V, thus equalizing on both sides of the piston. Having a larger area to act upon on the other end, the brake is released at once, the air escaping silently through the small opening S, and out to the atmosphere through the openings at W, at the end of the plunger.

It was found that 130 continued applications of the brake, applied while the car was at a standstill, lowered the pressure in the tanks 25 lbs., that is .19 of a pound each time the brake was applied.

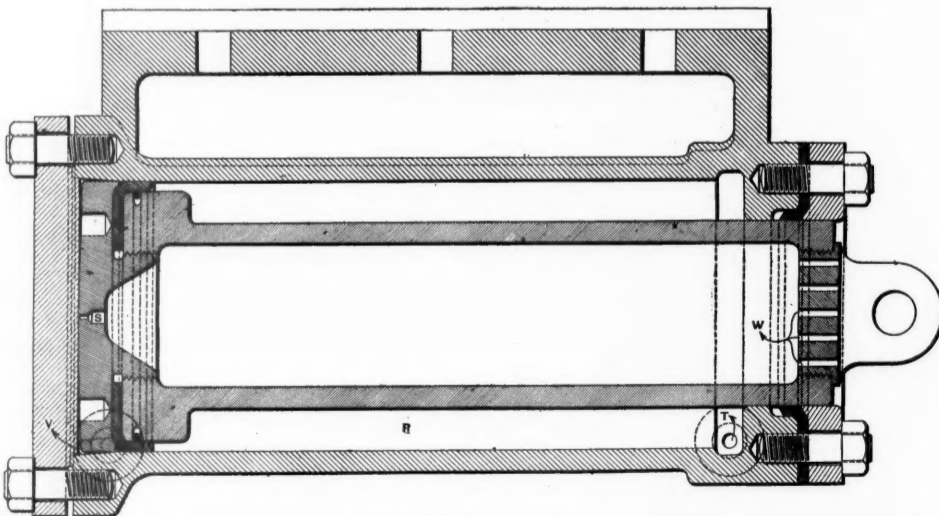


Fig. 5.—Air Brake Cylinder.

pated in the various stages of compression and storage, so that when it is ready to be used by the motor, its temperature may be reduced to about that of the atmosphere. When air is expanded in a motor, it will be cooled, for it is doing work, and the temperature may fall even below freezing point. In some air motors the exhaust has frozen and choked because of this low temperature. By heating the air before it enters the motor this difficulty may be obviated, besides at the same time obtaining more work from the air. By applying sufficient heat to the air, as much work may be produced by it in the motor as was done by the compressor.

Method of Operating.—A locomotive must occasionally stop to refill its tanks with water. Just so a compressed air motor car must take on a new supply of air. This is done very quickly inasmuch as the supply tanks are very large and air under pressure flows very rapidly. At the same time that the air is being admitted at a pressure of 2,000 lbs. into the reservoirs, steam is led into the water in the heater. When the car is ready to start the motorman opens the throttle, thus permitting the air to pass through a pressure regulator,

* For a thermodynamic discussion of compressed air consult Wood's "Thermodynamics," p. 63-70.

reducing the pressure in the tanks to the working pressure of about 150 lbs. per square inch. It then passes through the hot water tank and goes directly from there to the cylinder of the motor, which acts exactly as a steam engine working expansively.

The By-Pass Starting Valve.—The same lever that releases the brakes, (N, Fig. 2) operates, by a slight advancing movement on the quadrant, to open a by-pass admission of the compressed air, directly into the cylinders of the motors, enabling them to start easily and positively whatever the position of the cut-off valves may be, and preventing any possibility of being stopped on "dead centers," after which the throttle is opened.

The Accelerator.—When the throttle is open and the car is started, the motorman turns the handle N, Fig. 2, farther around on the quadrant, permitting more air to

Commissioner Billings in his opening address said, in part:

We are confronted with an almost insoluble problem—to give justice to the railroads and at the same time be just to all the people. Cheap and rapid transit is revolutionizing the business world; it is building up and tearing down; destroying business in one locality and building it up in another; making one rich, another poor. To one the transportation is too cheap, to the other it is too dear. In agriculture cheap transportation of farm products has nearly wiped out the New England farmer; has brought those of the Middle States upon their knees and built those up farther West, while those of the extreme West clamor that rates are too high and that all profits are absorbed in transportation. Cheap passenger fares are destroying the business of country merchants and small villages and building up and concentrating business in large cities. The great cities want passenger fares still cheaper, and make them so by frequent and cheap excursions, thus enabling large

cover for services rendered, not under the law of contract, but under the license of the sovereign to collect tolls. A toll is a tax, and railroad rates are taxes.

The first step in levying a tax is to get at the aggregate amount required; and in passing it is to be noted at this point that railroads, in sometimes collecting revenue to pay interest on what are called watered stocks or bonds, are only doing what governments do. The United States Government in 1861-65 had to sell its bonds for less than par, but when money was collected in the shape of taxes to pay the interest on these bonds, no one raised the cry that the taxation was to pay interest on watered securities. A railroad cannot issue a share or a bond without the previous consent of the sovereign, and the sovereign cannot find fault without taking the blame upon himself.

The aggregate of taxes (rates) which a railroad is entitled to collect (if it can, under its charter) is an amount sufficient to pay operating expenses, interest and a reasonable dividend. Such taxes would be reasonable and just.

The sovereign has the widest discretion in selecting a basis on which to levy taxes. In the case of a railroad the first question is, Has it sufficient traffic to enable it to collect enough revenue to meet its requirements? Sometimes it has hard work to do this, but so do governments. The highest potentates are frequently brought face to face with this problem. Many counties, cities and towns have been compelled to compromise with their creditors. The aggregate amount of taxation has, indeed, a relation to the aggregate cost of operation, but a single rate has no relation to the cost. It may be just and reasonable when less than cost. Two dollars a ton may be right for a ton of coal and \$15 a ton at the same time reasonable for a ton of drygoods, although the cost of each service is substantially the same. When Congress lays a duty on imported artificial flowers it does not ask what proportion of the cost of carrying on the government is due to the wearing of flowers on ladies' hats. A government like ours, having large and valuable imports, can raise its revenue easily and thus is not compelled to adjust import duties with nicety; but where imports are small or it is difficult to get sufficient revenue, then the only law is the necessities of public policy; then care must be taken that each duty or tax rate is just high enough and just low enough to bring in the largest revenue. Likewise, with railroad rates, they must be low enough not to check the movement of goods or passengers, while high enough to produce the desired income, if possible. The only question for a court to ask in such a case is whether the rate is just right to produce, in the long run, the greatest possible revenue from the class of traffic to which it applies. Where a railroad easily collects more revenue than is just and reasonable, this principle may be disregarded and rates raised or lowered as public policy may in particular cases demand.

If the foregoing premises are correct, railroad and municipal corporations are of the same class. The sovereign must confine each, in contracting obligations, to the authority which has been granted to it. He must see that their taxes are levied with uniformity and impartiality, and that they do not collect more revenue than the law allows. It is equally his duty to compel them to collect all the law allows, if that is necessary to meet their obligations, and if the field for taxation is large enough to permit it. When the directors of a railroad wantonly refuse or neglect to levy sufficient rates to meet its obligations, the court should compel them to do their duty, as it would in the case of a negligent city tax board. Holders of railroad securities have a clear right to demand this.

There was no discussion on Mr. Stickney's paper and the Secretary next read a paper by Mr. W. P. Clough, Vice-President of the Great Northern Railway, on

THE INFLUENCE OF THE INTERSTATE COMMERCE LAW ON RAILROAD EARNINGS.

In the year 1887, before the Interstate Commerce law had begun to have an influence, the railroads in this

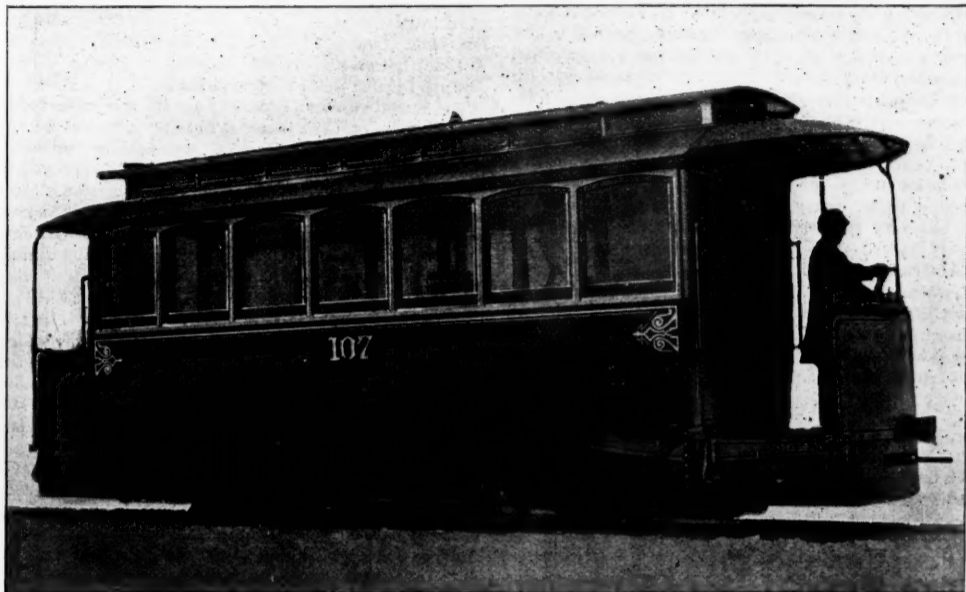


Fig. 1.—Car of the General Compressed Air Company, Equipped with the Hardie Air Motor.

pass into the cylinder of the engines, producing an extra pressure of 60 lbs. As soon as the car is under way the extra pressure is shut off. By means of this ingenious device the car gets up speed very quickly, and by means of the by-pass insures starting without delay.

Results of Tests.—It was found by a test on car No. 107, running with a load of 6,000 lbs. and 6 passengers, making 92 stops, and running a distance of 16¼ miles in one hour and 41 minutes, that 372 cu. ft. of free air was used per car mile. The initial pressure was 2,060 and final 140.

The cost of compressing to high pressures is not as great as is usually supposed. It has been found as the mean of a number of tests that it takes but 1.38 times as much power to compress to 2,000 lbs. as it does to 500 lbs., making the cost of compressing 1,000 cu. ft. of free air to the higher pressure a little less than three cents.

National Convention of Railroad Commissioners.

The eighth annual convention of State Railroad Commissioners was held at the office of the Interstate Commerce Commission, Washington, May 19 and 20, Hon. S. R. Billings, of Michigan, in the chair. The persons answering to the roll call were the Interstate Commerce Commissioners, with the Secretary, Assistant Secretary and the Statistician of the Board, and the following State Railroad Commissioners: *Connecticut.*—William O. Seymour, Alex. C. Robertson. *Georgia.*—Thomas C. Crenshaw, Jr. *Illinois.*—J. W. Yantis, D. R. Levy (secretaries). *Iowa.*—George W. Perkins, Charles L.

department stores to absorb the trade for many miles around.

This business revolution cannot be stopped, but every effort should be made to protect the weak against the strong. No two prices should be allowed. No wholesaling of transportation should be permitted. Every form of discrimination should be prohibited. All legislation and rulings of commissions should be in the line to promote safety, equality and stability.

RAILROAD RATES ARE TAXES.

The first business was a paper by Mr. A. B. Stickney, President of the Chicago Great Western Railroad, which was read by the Secretary. Mr. Stickney discussed the questions, What are railroad corporations, What are railroad rates, and What are the limitations to the state's control of rates? Under the first head he compared private corporations, such as manufacturing, with public corporations, such as a city. A railroad exercises some of the functions of the sovereign, under his license and subject to his control, and therefore is a quasi-public corporation. Under the second head the essayist contends that a railroad corporation is not a common carrier, as that term is understood in the common law, as the charges made for railroad service are not a quantum meruit for the specific services performed. The courts have indeed held that railroads are common carriers, but there is a broad distinction between the nature of railroad rates and the quantum meruit. If a railroad rate is to be based on each specific service performed, the courts will have to determine the cost of service, which is impossible, owing to the varying and unknown factors entering into the computation. This presents a problem that cannot be solved, and there is no way out of it except

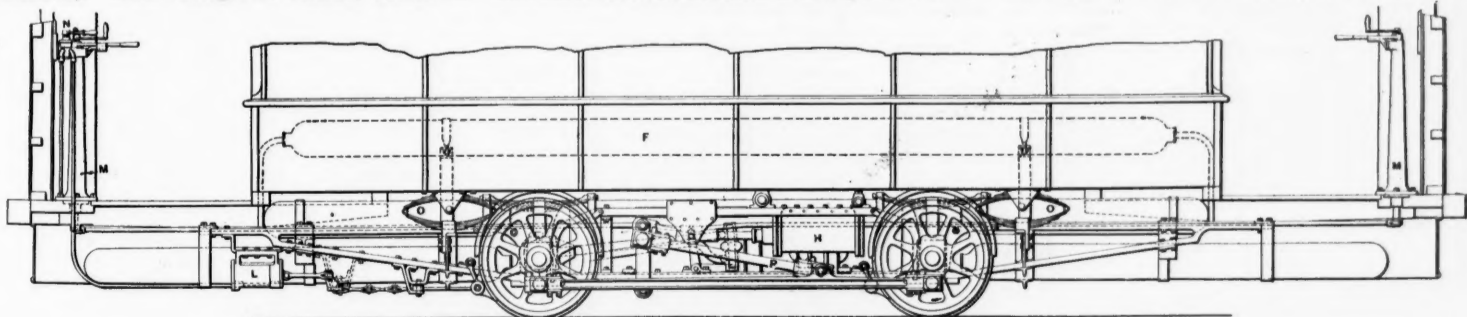


Fig. 2.—Elevation of Car, Showing Details of Equipment.

Davidson, D. N. Lewis (clerk). *Michigan.*—Simeon R. Billings. *Minnesota.*—W. M. Liggett, Ira B. Mills, George L. Becker, A. K. Teisberg (secretary). *Mississippi.*—John D. McInnis. *Missouri.*—Joseph Flory. *North Carolina.*—J. W. Wilson, S. O. Wilson, E. C. Beddingfield, H. C. Brown (secretary). *North Dakota.*—John W. Currie. *Ohio.*—William Kirkby, C. H. Moore (statistician). *Pennsylvania.*—James W. Latta, Secretary of Internal Affairs; Isaac B. Brown, Superintendent Bureau of Railways. *South Dakota.*—George A. Johnston. *Virginia.*—James C. Hill, E. G. Akers (secretary).

cept to recognize that railroad service, being performed by the sovereign, either directly or through an agency, must be supported by a tax. The old-fashioned common carrier, an individual or a private corporation, transporting goods on the common highways, either on land or sea, had no exclusive right. His obligations rested upon his contract with his customers, expressed or implied. He could go in or out of business whenever he chose. The law could say to him, You must accept what your services are reasonably worth. The individual may trade or may have favorites, but the sovereign must not. The railroad, acting for the sovereign, has a right to re-

country earned about 500 million dollars on interstate traffic. This vast business had grown up in 40 years without a line of statute law. It had been controlled wholly by the unwritten common-law rule, enforceable in the courts, that rates should be reasonable in themselves and not discriminate between persons or places. The Interstate Commerce law merely put these maxims into the statute. Regular and frequent patrons of railroads have always had the courts of equity to vindicate their rights, not only as to defined grievances, but as to future shipments. It was not necessary to make each consignment the subject of a separate lawsuit. If, before

the Interstate Commerce law, shippers did not use this remedy it was because they did not choose to. The second powerful regulator of railroad service has been the pressure of competition. With the two, the railroads of America have provided the most efficient and cheap transportation in the world.

Mr. Clough then compared the traffic, earnings and average receipts of the railroads in 1882 and in 1887, as found in Poor's Manual; finding a decrease in the average freight rate of 16.3 per cent., in passenger rates of 7.6 per cent., and an increase in the volume of traffic per mile of road of 9.8 per cent. The prices fell in spite of a rapidly expanding demand. This reduction was steady and gradual. It was not caused by actual interference of the Government. It was chiefly the power of competition, in spite of unrestricted pooling, which, with all the braking power hoped for from it, failed to conserve railroad profits. The railroads increased the efficiency of their service, carrying 21 per cent. more freight in a train without a material increase in cost, yet all the saving went to the public. A large part of the savings on freight were undoubtedly handed over to passengers. On this point Mr. Clough says:

A reasonable passenger-train service is essential on every road. Without a circulation of people that of commodities would be enormously restricted. In a very broad sense passenger trains are necessary auxiliaries of freight trains. Business resulting in freight traffic cannot be done in an advantageous way nor on an adequate scale, unless people can get about the country to do it. Facilities for travel should also be reasonably comfortable. But the number of passenger trains run, the quality of the rolling stock of which they are made up, and the rate of speed at which they are run should always be strictly governed by the extent of the willingness and ability of the public to pay for them at a fair price.

It is a matter of common observation that for the last dozen years the disregard by the railways of the country of this perfectly indisputable proposition has been almost universal. Hence many of these tears which for some time railway security holders have been shedding. Fine properties have been exhausted by an excess of luxurious and fast passenger train-service in regions where a substantial passenger traffic has had no real existence. In fact such a traffic has hardly yet come into existence in any part of the country west of New York and Pennsylvania.

We know that since 1880 the first cost of the cars making up an average passenger train running 400 miles or more has about doubled. The cost of maintaining them has increased in near the same ratio, because so much more mere ornament must be kept in a handsome state. The cost of hauling in a train has grown in about the same way, because with diners and sleepers weights have doubled and running time been largely cut down.

A track much used by freight engines of the heavier sort can be kept fit for high-speed passenger trains only at a great outlay of labor and money.

The only reason heard for the enormous increase in outlays for passenger service, which have gone into practice since 1880, is that the public will be induced to travel more and to pay better average rates. But the facts have been the opposite. In the five-year period above considered, the relative patronage of passenger trains had fallen nearly 5 per cent., and the earnings a little more than 7 per cent.

Coming now to the statistics five years later (1892 for passengers and 1893 for freight) a large increase in the volume of traffic per mile of road is again found, with a decrease in the ton-mile rate of 13.6 per cent., and in the passenger rate of 4.8 per cent. The average freight train load had again increased over 9 per cent., but the passenger-train load had decreased over 5 per cent. Again the money saved by the railroads had slipped away from them and gone to the public. In the five years last preceding the Interstate Commerce law the annual rate of decrease in earnings was 3 per cent., and in the first six years following the passage of the law it was only 2.25 per cent.; that is, the downward tendency was stronger before the restrictions of that law were brought to bear, than it was afterward; the Interstate Commerce Act has not really had any effect to lower average railroad rates. Competition has done it all.

Rivalry between carriers for the possession of traffic merely moving between common points on their own lines is of no account. A division of this or of its earnings is an easy question. The carriers are alone concerned. The real and irreconcilable competition is not at all that of rail with rail or boat with boat, but that of rail with boat, producer with producer, and region with region. Fortunately for the producer and consumer, the best peopled part of this country is skirted along two edges by stretches of deep water. These stretches lie in directions to conveniently connect the regions that produce most with those that consume most. No pool or other device can long dominate transportation by sea or by the Great Lakes. In a month's time a few tramp vessels can shatter the strongest agreement to maintain rates between ports that ever has been patched up. The vessel owner has no way to provide or maintain. Nature and governments provide it for him gratis.

Neither has the Interstate Commerce act done much to establish equality of rates as between persons and places. On the face of the published tariffs it may seem to have done considerable. Unfair advantages, however, are not given by tariffs, but in somebody's private office. It is to be hoped that they are not now given at all; but if they are, it is because the carrier is forced to give them. No fate can happen a carrier who is deeply in debt, with every bit of his property mortgaged, as all American rail carriers are, more disastrous than to suffer a diminution of earnings that will put him into default. This is complete destruction. He is going to avert this, if possible. On much of the mileage of this country a comparatively few patrons—often a half dozen men, sometimes even one man—can control enough traffic to determine the solvency or bankruptcy of the property. The power of the patron is as well

known to himself as to the carrier. Can it reasonably be supposed that he will not try to use it? He will invariably try; and it would be a miracle if at times he should not succeed. But be sure of one thing—the carrier will never cut his tariffs unless the shipper forces him to do it. Does the Interstate Commerce act give the carrier the safeguard in this respect that he should have? It is to be feared not.

Mr. Clough's paper being open for discussion, Commissioner Knapp, while agreeing to most of its propositions, said that a mistake had been made in assuming that there was a common law doctrine enforcing equality of charges between individuals in the same community. While at common law it has long been settled that the charges of the common carrier must be just and reasonable, there was no common-law doctrine forbidding a carrier to allow rates to some of its customers which were unreasonably low. If the rate exacted from the shipper or patron complaining was held by the courts to be reasonable, his complaint was not sustained because somebody else got transportation at a lower figure, so that if the maximum or ordinary rate applied by a common carrier—and this doctrine extends to a very recent date and includes railroad transportation—was held to be reasonable, or was reasonable in fact, it was no violation of law for the carrier to allow a lower rate than that to any party it saw fit to favor. That doctrine has very recently been held—in a decision of the Court of Appeals of New York, where all of the English and American authorities on that subject are collated. And, therefore, while it is true that the first section of the act to regulate commerce, which says that rates shall be just and reasonable, is a declaration of common-law rules as held and maintained by the courts, I think that is not true of the second and third sections.

REPORT OF COMMITTEE ON RAILROAD STATISTICS.

Mr. Henry C. Adams, Chairman, presented the report of this committee. He reviewed its works since 1889, which has resulted in substantial uniformity in railroad returns throughout the country; and the simplicity thus accomplished has led the railroads to make reports with greater care. Progress toward uniformity is as rapid as could be expected.

While the committee has abandoned the separation of operating expenses into passenger and freight it has not abandoned the principle that statistics should be the basis of reasonable rates; and it is still hoped that reports of freight earnings by commodities, or classes of freight, may be had before long. It is believed that the chief difficulty in state control is the inability to easily get certain facts, and the public interests demand more intimate connection between the statistical branch of the Government and the railroads. Something like the relation between the Controller of the Currency and the national banks should be established.

PROTECTION OF PUBLIC INTERESTS DURING RAILROAD LABOR CONTESTS.

The report of this committee was read by Mr. Edward A. Mosely, Chairman. He held that there are but three ways to protect the public interests during railroad strikes. First, to use the U. S. Army; second, the injunction, and third, mediation, conciliation and arbitration. The first two are undesirable. Strikers receive sympathy when bayonets are turned against them. Our standing army is small and the army of railroad employees is large. The use of the power of injunction by the courts has created great dissatisfaction, and there is a demand that Congress define and restrict the power of punishment for contempt. The third remedy is the only feasible one, and it should be employed as far as possible. But even this may fail and then the courts should take control of the railroads. Mr. Mosely approves a bill drawn by Secretary Olney authorizing the Attorney General to apply for the appointment of a receiver for any railroad pending the continuance of a labor controversy. This would bring pressure to bear upon railroad managers and upon the employees. The managers would submit to arbitration rather than to temporary management of the road by the Government.

REGULATION OF ELECTRIC RAILROADS.

Mr. Isaac B. Brown, of Pennsylvania, read the report of the committee which had been appointed to consider this subject. The committee believes such regulation imperatively necessary. In only nine states are street and electric railroads subject to state supervision, like steam railroads. In five states such roads are allowed to carry express matter, and in five they carry mail. In four states they are allowed to carry freight and express. After a general review of the subject the report presents a resolution that whenever these roads have developed so as to carry an appreciable amount of passenger or freight traffic across state lines, Congress should provide for their regulation; and that it is desirable that uniform laws be passed in each state of the Union regulating electric railroads. The resolution was adopted.

In the discussion on this report Mr. Henry C. Adams spoke of the desirability of uniformity in the accounts of electric roads, as in those of standard railroads. The state of New York already requires annual reports, based on such uniform accounts. Mr. Adams offered a resolution calling the attention of the auditors of electric roads to the desirability of making their accounts uniform with those of standard railroads as now prescribed by the Interstate Commerce Commission. Mr. Seymour, seconding the resolution, said that his state, Connecticut, already required reports from electric roads. The Commissioners had prepared a form, like

that of the Interstate Commerce Commission, for the reports of electric companies. The resolution was adopted.

WORK OF STATE COMMISSIONS.

In conformity to a vote passed last year, the railroad commissioners of eight states sent in summaries of the work they had done during the past year, and these were read by Mr. Seymour. The California commissioners have recommended that carriers be compelled to own and operate fruit cars. Where the traffic is large, roads should furnish the best refrigerators. The commission has taken no important action since the injunction forbidding it to reduce grain rates on the Southern Pacific. The decision on that injunction is expected before long.

The Connecticut commissioners have considered 67 complaints or applications during the year. They believe their semi-annual examination of the physical property of railroads stimulates the officers to maintain a higher standard. One of the commissioners attends upon the railroad committee of the Legislature during its sessions to furnish needed information.

The Massachusetts Commissioners now have to spend a good share of their time in hearing cases under the anti-stockwatering law of 1894. No stock or bonds can be issued without their approval, which approval is given only after careful and expert investigation. Most of the cases have been those of electric roads. The railroad inspectors, appointed by the Board under the law of 1894, have effected important reforms in the physical condition of railroads without making formal complaint.

The Minnesota Commissioners find their work largely that of dealing with informal complaints, of which there have been many. The Commission is firmly of the opinion that the mere existence of such a tribunal tends to allay much of the feeling that formerly existed against railroads. The commissioners also supervise grain warehouses and inspection of grain.

The Railroad Commissioner of Michigan names 14 classes of duties imposed upon him by law. He computes the taxes, inspects all of the roads once a year and is often called upon to arbitrate between companies. He does not establish rates, being only charged with the duty to see that there is no discrimination and no violation of the "long and short-haul" principle.

The Railroad Commissioner of Kentucky hears complaints of discrimination, fixes the value of railroad property for taxation and makes a personal yearly inspection. The number of miles of railroad in Kentucky (December, 1895), was 3,044 and the amount of taxes for that year \$221,727. A brief list of complaints heard during the year is given.

The Railroad Commissioners of Texas describe briefly their powers under the law, and state what action they have taken during the year in the matter of freight rates. The Commissioners have had an expert valuation made of all the roads in the state. This is done for the information of security holders and to furnish a guide for the state in authorizing the issue of bonds or stock and in making rates.

The Railroad Commissioners of Iowa send a long account of their duties, as described in the laws of the State. During the year they have heard 89 complaints, of which 10 were made the subject of reports and 79 were closed by correspondence. The length of railroad in Iowa is 8,486 miles. The stock held in Iowa is \$5,651,073, while it is estimated that the stock represented by railroad actually lying within the State is \$149,590,118. The debt, estimated on the same basis, is \$170,233,870.

Mr. William Kirkby, Railroad Commissioner of Ohio, presents a brief summary of his work during the past year. The income of the railroads decreased but their physical condition was kept up. The rate question is not prominent in Ohio, on account of its favorable location. The Legislature has recently given the Commissioner additional power in compelling interlocking at grade crossings and has ordered fire extinguishers carried on trains. The railroads are now, under his order, putting in metallic blocks to make frogs and switches safe for yard men.

GOVERNMENT OWNERSHIP AND CONTROL OF RAILROADS.

The report of the committee on this subject was read by Mr. Teisberg. The committee believes that if the public authorities were to ascertain and publish authentic information as to the actual value of railroads, as is done in Texas, the public would be convinced that the railroads are not getting rich too fast out of their earnings. Some roads are earning more than a fair return upon their properties, but in the great majority of cases the opposite is true. Information about the roads, to be of value, should be obtained by federal and not by state authority, and therefore the committee recommends that the convention lay the subject before Congress. Discussing the difficulties due to our dual system of government, Congress having authority only over interstate traffic, the committee believes that it would have been better if the Constitution had given Congress the right to regulate commerce within the states; that the states would not lose any substantial rights by giving the federal authorities the power to adjust rate controversies. Special courts should be created for the adjustment of railroad complaints, as proceedings in the federal courts at present are necessarily slow. The additional cost of maintaining separate courts would be small compared with the advantage of speedy decisions. On the question of government ownership the committee discusses the principal arguments pro and con and holds that it is undesirable, except as a

last resort. The committee recommends the passage of laws, both by Congress and by state legislatures, to prevent over-capitalization in the future, and to control the construction of new roads.

Mr. Wilson, of North Carolina, read a minority report strongly advocating government ownership. He presented resolutions to this effect, which also included a request that Congress foreclose its claims on the Pacific railroads, with a view to operating the same in the name of the people as a practical test of this method of solving the transportation problem. Mr. Latta, of Pennsylvania, read a paper on "Government Control," quoting C. F. Adams, Hadley, Acworth, Findlay and others against government operation of railroads.

REPORT ON SAFETY APPLIANCES.

The committee on this subject made no report, but a paper was presented by Mr. Flory, of Missouri. He made observations on all of the principal devices and methods now in use which came under this head. Among these he spoke of the individual call bell, used by train dispatchers on certain roads in the West to call telegraph operators at small stations. He warmly commended this device and said that where it is in use the ringing of the bell is well understood by all employees, so that if an operator is not within hearing some one hunts him up. Trainmen will not pass a station where they hear the bell ringing, for they understand that it may mean an important message for them.

THE IMPRISONMENT PENALTY.

At the close of Mr. Flory's paper Mr. Becker introduced a resolution, which was passed, protesting against the passage by Congress of a bill now pending to abolish the imprisonment penalty of Section 10 of the Interstate Commerce act. The resolution recited that all parties to rate cutting should be severely punished; that the law had had no fair chance until the Brown decision came out, and that if now the law is not effective the penalties ought to be made severer. The Interstate Commerce law should not be amended except in the direction of more thoroughly protecting the rights of the people and more fully establishing the power of the Interstate Commerce Commission.

UNIFORM CLASSIFICATION.

The committee on this subject held a meeting in New York, Oct. 23, 1895, at which several railroad traffic men were present. The committee agreed upon a classification and several traffic associations approved it, but one at least had disapproved and that blocked the whole proceeding. Circulars had been sent to Commissioners of 28 states; 22 replied, of which 18 expressed themselves in favor of uniform classification and of immediate action by Congress. The report ends with a proposed resolution that Congress direct the Interstate Commerce Commission to make a classification if the railroads do not. The reading of the report was followed by a brief address from Mr. Bird, of Chicago. He described the efforts of the railroads in the past to agree upon a uniform classification. He believed that it would be a benefit to the railroads to have one and hoped the committee would succeed in its aims. Any classification would meet strenuous objection, more than the railroads could withstand; therefore the only way to introduce this reform is for Congress to make it mandatory.

At this point it was voted, on motion of Mr. Flory, that the reports on government ownership, both the majority and the minority, be laid on the table. (All other reports presented to the convention were adopted.)

The committee on pooling had had no meeting, but Mr. Reagan, of Texas, and Mr. Lape, of Illinois, members of the committee, sent letters advocating legalized pools, under the supervision of the Interstate Commerce Commission.

Mr. Mills, of Minnesota, spoke on "Delays in Enforcing Orders of Railroad Commissions," but suggested no definite remedy. The committee on the next convention made a report, which was adopted, naming Mr. Isaac B. Brown, of Pennsylvania, as chairman of that convention. It is to be held at St. Louis, May 11, 1897.

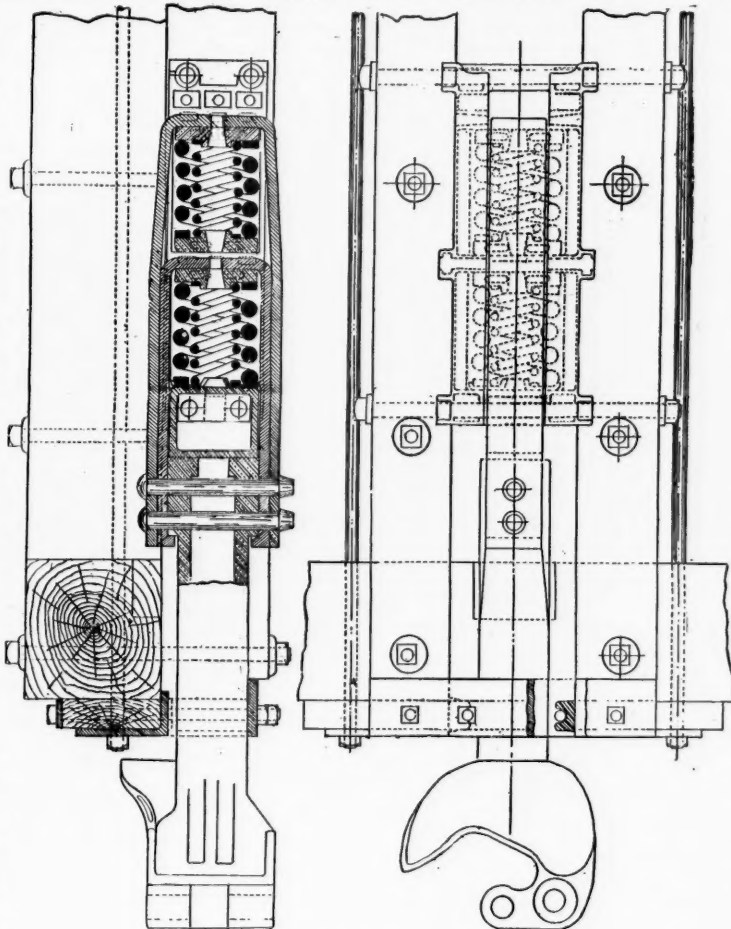
The committees for the next convention were announced by the presiding officer. The Chairman of the Committee on Arrangements is Joseph Flory, of Missouri; on Uniform Classification, I. B. Mills, Minnesota; on Statistics, Henry C. Adams; on Work of State Railroad Commissions, Geo. M. Woodruff, Connecticut; on Legislation, J. W. Currie, North Dakota; on Pro-

gramme, J. H. Paddock, Illinois; on Safety Appliances, Joseph Flory, Missouri; on Delays in Enforcing Orders of Commissions by Procedure in Courts, W. W. Ainsworth, Iowa.

RAILROAD TAXES.

Mr. Paddock, of Illinois, presented a paper on this subject, which, although not read, is to be printed in the Proceedings. The writer alleges that the preliminary annual financial reports of the Interstate Commerce Commission are deceptive in not mentioning the amounts of taxes paid by the railroads, and he protests that taxes should always be included in operating expenses, so that "net earnings" shall mean the sum available for rentals, interest and dividends.

The paper presents a comparison of railroad taxes in Great Britain and in the United States. Comparing 1887 or 1888 with 1894 or 1895, he finds that the taxes, including government duties, paid by the railroads in Great Britain, have increased 26.71 per cent.; while in this country taxes have increased 54.31 per cent. During this time the length of railroad has increased only 7.79 per cent. in Great Britain and 11.41 in this country; the gross receipts of the British roads increased 17.61 per cent.; in the United States, 10.15; net receipts, before deducting taxes, increased in the United



Bryan's Draft Rigging.

Kingdom 9.55 per cent; in this country only 3.08. Net earnings applicable to rentals, interest and dividends increased in England, in seven years, 8.26 per cent., while in this country the increase was only 1.66 per cent.

Rapid Transit in New York.

We give in the editorial columns of this issue a synopsis of the opinions of the Justices of the Supreme Court, in the matter of the plans of the Rapid Transit Commissioners of New York. The Commissioners have issued an address to the people, which should be read by those who care to get a fair view of both sides. What follows is especially important in its bearing on the responsibility of the engineer for the estimates of cost.

"The financial restriction laid down by the court thus peremptorily ends the discussion under the present law. . . . The administrative authorities of the city and state have unanimously confirmed their view of the business question, and the Commission must respectfully dissent from the declaration of the Appellate Division that their disposition is 'to enter upon this enterprise regardless of and in utter ignorance of the cost, trusting to the distant future to help the enterprise out of the difficulties by which it is admittedly surrounded.' The Commission must respectfully deny that it has been guilty of blind confidence. It cannot admit the truth of the suggestion that it ignored the question of cost. On the contrary, that question far more than any other occupied the time and engaged the labor of the Commission. What the Commission deemed to be the overwhelming consensus of competent expert opinion upon cost was submitted to the Supreme Court Commission and the Appellate Division. The Commission spared no pains to ascertain the limit of cost. All necessary borings were made, quantities

definitely ascertained, and prices fixed. The engineer of the Board was required to prepare in detail his estimates. They were required to be outside estimates. He was required to submit them to Messrs. Theodore Cooper and Alphonse Fteley, distinguished experts of large practical experience. These experts spent six weeks in practical investigation of cost. They adopted liberal unit costs and determined maximum quantities. After receiving the report of Messrs. Cooper and Fteley, this Commission, in view of the vital importance of the question, took the opinions of other experts, Messrs. Octave Chanute, Charles SooySmith, Thomas C. Clarke and William H. Burr, and also of Abram S. Hewitt. They were all gentlemen of the first distinction, who had large experience in important works. All of them, except Mr. Hewitt, were technical experts, and Messrs. SooySmith and Clarke had themselves been contractors for great undertakings. They confirmed the report of the Chief Engineer and of Messrs. Fteley and Cooper.

"The Appellate Division has assumed that the cost was estimated at about \$50,000,000. But the cost, as estimated, was less than \$39,000,000, including more than \$3,000,000 of interest.

"While the Commission was being enlightened on the question of cost by study and the opinions of its experts, it was also consulting responsible parties who contemplated interesting themselves as contractors, and they confirmed the opinions of the Commission's experts upon the question of the probable cost of the work.

"Working details were not prepared because the law required consent of the Appellate Division first, wisely, the Commission thinks, so as to enable the Board to arrange such details with proposing contractors."

Draft Gear for Freight Cars.

At the April meeting of the Northwest Railway Club the subject of draft gear was taken up for topical discussion. Extracts from the remarks of the various speakers follow:

Mr. E. A. WILLIAMS (Mech. Supt., Soo Line): I think will be conceded by all who are in charge of freight car repairs that the maintenance of freight car equipment on account of weak draft gear is one of the largest items of expense in the repair of cars. Improvement in draft gear has not kept pace with the other improvements of freight car equipment. If we pass through any large freight yard and examine the draw gear of different cars, we find that, practically, a large majority of cars have the same design of draft gear that was applied 15 years ago on 20,000 to 25,000 capacity cars. While it is true that parts of the attachment, such as pocket-straps, follower plates, draw lugs and springs, are made heavier in order to resist the pulling and buffing, at the same time they are attached to the draft timbers in practically the same manner as was the practice on lighter cars—that is, the draw lugs are bolted, each independently to the draft timbers, which, in itself, is an element of weakness. There are many excellent devices, in a number of cases patented, which are an improvement for draft gear. Among others I might mention one where the spring is enclosed in a casing with double projections on each side of the spring pocket, gained into draft timbers, the bolts extending through both draft timbers and spring casing, and bolting the draft timbers and spring casing, or both, firmly together. I think this is a decided improvement, and an arrangement that will reduce the damage to the draw gear. There are others that I have noticed, such as double springs, and I, in one case that I have in mind, where not only double springs, but a double pocket strap, are used. This, in my opinion, is a very excellent device, and one that certainly will reduce the cost of repair of draft rigging. Of course the continuous drawbar is an improvement over the old style of drawbar rigging, but, from my observation, there is an element of weakness in the continuous bar, *i. e.*, it is liable to stretch, and I think there has been considerable difficulty experienced in keeping the rods at the proper length. On a large number of cars that have recently been built I noticed that the drawbars have been applied directly to the center sills, doing away with draft timbers. An arrangement of that kind would be impracticable on cars already built for draft timbers, for the reason that it would raise the drawbars too high above top of rail. At the same time, it strikes me that where cars are designed to place the drawbars or couplers between center sills, it is a very excellent arrangement.

Mr. H. S. BRYAN (M. M., D. & I. R.): We are using and have adopted a standard draft rigging composed of two sets of springs, set tandem within the side castings which are secured to the draft timbers, and bolted together with through bolts, making it impossible for the draft timbers to spread, and also protecting them from abrasion by chafing of the follower plates. We have probably 2,000 cars equipped in that manner, which are giving very satisfactory service. We have never yet broken any springs or parts of the attachment, either in wrecks or actual service. From my experience with the device, I could recommend it for cars in heavy freight service. By the use of two sets of springs we get double the resistance that is obtained in a single spring draft rigging. Our standard is a 6 x 7-in. double-coil spring. Of course any sized spring could be used according to the capacity required. With two 6 x 7-in. double-coil springs we get a resistance of from 34,000 to 36,000 lbs., both in buffing and pulling. The device is of malleable iron side castings, provided with suitable stops for the spring followers. On the rear end

of the drawbar are riveted two yokes—the inner yoke providing a pocket for the forward spring and the outer or longer yoke taking the rear spring. The inner yoke compresses the forward spring and the outer yoke the rear spring in pulling. In buffing, a square, sliding, box-shaped spring follower at the end of the drawbar compresses the forward spring, and the rear end of the inner yoke the rear spring; so the pressure both in buffing or pulling is applied to both springs simultaneously.

The side castings we are using are about 25 in. long, provided with three lugs or ribs, which are gained into the draft timbers, 1 in. deep, and are 2 in. in width. On account of the large bearing of the side castings on the draft timbers, we have found that it is not necessary to use the best quality of oak for draft timbers. We have several hundred cars equipped with pine draft timbers, and in our very severe service, on heavy grades and switching, we have found they meet all requirements. That is quite an item in the reduction of the cost of draft timbers.

The additional cost per car would be for the extra yoke, which (made of 4 in. \times $\frac{1}{2}$ in. iron) weighs about 54 lbs., the extra spring and two extra followers. The followers and side castings are made of the best malleable iron, and very light, all castings, including follower plates, weighing only 230 lbs. per car. The cost of the extra springs, at present prices, is about 75 cents each, and the extra followers, which weigh $2\frac{3}{4}$ lbs. each—probably \$2 to \$2.50 extra would cover the cost per car over the old style draft rigging.

President BROOKE: I would like to ask Mr. Bryan if

them substantially as strong as the combination pocket shown by Mr. Bryan. We have a great many cars fitted up in this way, some of them having been in service for a number of years, with very satisfactory results, in fact it is almost impossible to destroy the draft rigging without king the car.

April Meeting of the American Railway Association.

The proceedings of this meeting have been issued by the Secretary. We note such of the doings of the Association as were not reported in the account published on April 24, page 285. The proposition to amend rule 7, so that an ex-officer of a railroad may be an officer of the Association, was voted down. This was done at the instance of Mr. E. B. Thomas, who pointed out the possible danger to the efficiency of the Association in thus widening the scope of the membership regulation. The influence of the Association in the past, which has been great in spite of the fact that its action is only recommendatory, has been due to the conservative spirit manifested, and to the fact that the decisions of the Association were universally looked upon as in a large degree the official action of the railroad companies. Colonel Haines stated, after the vote was taken, that he had been opposed to the proposed change from the beginning. Mr. Thomas presented an amendment, which is to be voted upon at the next meeting, in October, making ex-officers of railroad companies which are members of the Association, eligible to honorary membership.

The Committee on General Regulations reported that

requisites of installation for the telegraph block system; rules for the same, classified into rules for signalmen and rules for engineers and trainmen; requisites and rules, likewise classified, for the controlled manual block system; and requisites and rules for the automatic block system, was adopted with very little discussion. It will be remembered that some of the rules proposed by this committee were sharply criticised at the October meeting; these rules have been omitted, and the report now presented avowedly confines itself to conditions believed to be common to all lines. The committee reminds the members that the code will have to be supplemented by additional rules to meet individual requirements. The code as reported contains the definitions "home block signal," "advance block signal" and others which have heretofore been objected to as unnecessary or illogical. The use of the word "danger" to describe a signal indication is abandoned. This and the approval of a code of bell signals are the principal features of value in the report. The bell-signal code is as follows:

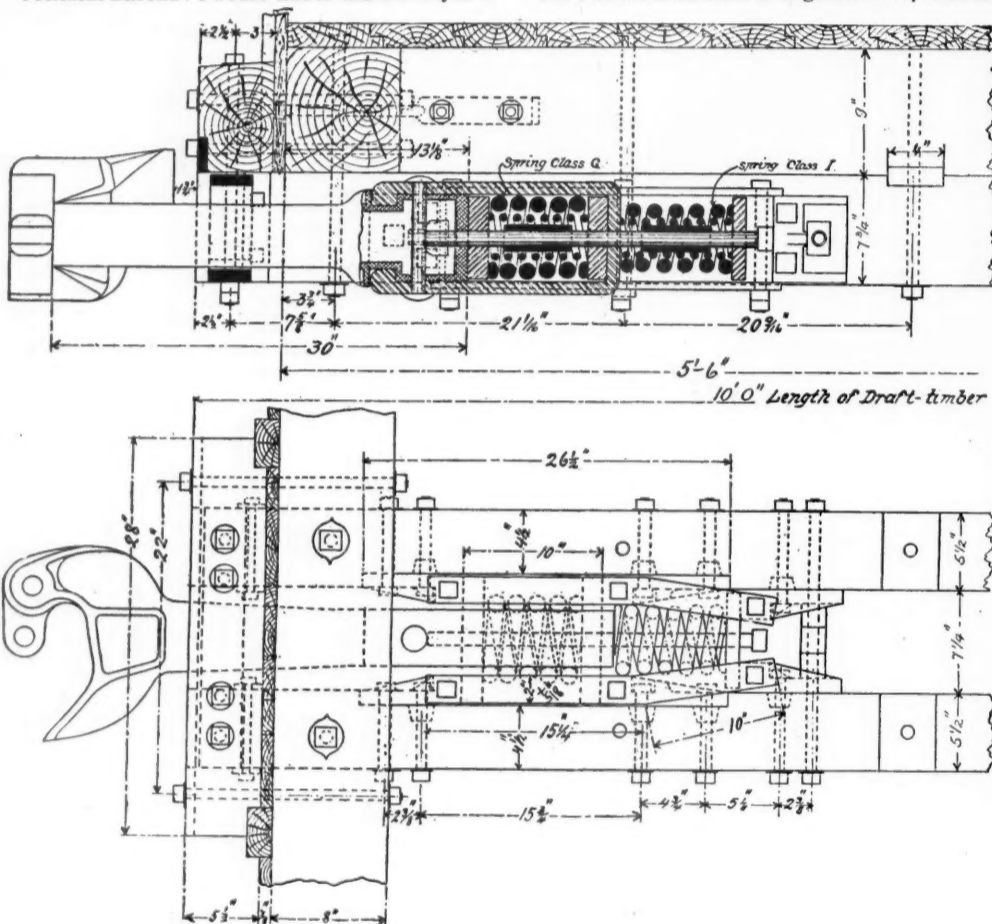
- 2—All right. Yes.
 - 3—Unlock my lever. Answer by unlocking, or 5, or 3-1.
 - 4—Train has entered block.
 - 5—Block is not clear.
 - 6—Has a train entered this block? Answer by 2, or 2-1.
 - 1-2—Clear. Train has cleared block.
 - 2-1—No.
 - 2-1-1—Has train cleared block? Answer by 1-2, or 5.
 - 3-1—Have unlocked. If levers are not released, instrument must be out of order. Block is clear. This signal must be answered by 3-1 and the answer acknowledged by 2. It must not be used unless the block is known to be clear. A signal man having received 3-1 and answered it by 3-1 and received 2 in acknowledgment, may allow train to proceed under Rule 617, announcing it by 4.
 - 3-3—Train in block will take intermediate siding. Answer by 3-3.
 - 3-3-3—Obstruction in block. Stop all trains approaching this station. Answer by 5-5-3.
 - 3-3-3-3-3-3—Train in block has broken apart. Answer by 3-3-3-3-3-3.
 - 4-4—Cars running away in the wrong direction and proceeding toward you. Answer by 4-4-4.
 - 4-6-4—Cars running away in the right direction and proceeding toward you. Answer by 4-6-4.
 - 2-3-3—Train has passed without markers. This signal to be given to station in advance. Answer by 2-3-2.
 - 5-2-5—Train has passed without markers. This signal to be given to station in rear. Answer by 5-2-5.
 - 1-4-1-4—Stop train approaching and have it examined. Answer by 2.
 - 2-2-2—Previous signal given in error. Answer by 2.
 - 2-4-2—Repeat previous signal.
 - 6-6-6—Testing. Answer by 6-6-6.
 - 1—(Long stroke.) Answer by telegraph call.
- When bell circuits for signaling between a block station and outlying switches are used, the following signals will be given and observed by conductors and signalmen:
- 1-2-3—Train has gone on siding. All Clear. Switch closed. Answer by 1-2-3.
 - 3-4—Train is ready to leave siding. Answer by 3-4, or 5. Conductor when ready to go will give 3-4, and will not start his train until 3-4 has been given in reply, and this must not be given by the signalman unless the block is clear.

Copies of the revised edition of the Standard Code, showing the train rules under their new numbers, and containing the block signal rules, may be had of the Secretary, W. F. Allen, 24 Park Place, New York City, at \$1 each.

Plan for Removing Grade Crossings in Newark, N. J.

We present herewith a plan and profile showing the proposed new grades of the Jersey Central and Pennsylvania railroads for abolishing grade crossings in Newark, N. J. As will be seen from the cut, this work will require the tracks of the Pennsylvania main line to be raised for a distance of about 8,600 ft., the greatest deviation from the present grade being 16.70 ft. The Center Street branch of the Pennsylvania will be raised for about 1,400 ft., the highest point being about $8\frac{1}{2}$ ft. above the present grade. The tracks of the Jersey Central will also be raised for a distance of 2,800 ft., the greatest deviation from the present grade being about $8\frac{1}{2}$ ft. Twenty bridges will be required for carrying the tracks of the Pennsylvania over the cross streets and one where it is crossed by the Jersey Central. Only one bridge will be required on the latter at the point where it crosses Mulberry street. No agreement has yet been made between the city and the railroads for carrying out the work, and it will probably not be done for some time. The following is a part of the report made to the Board of Street and Water Commissioners by Mr. Alfred P. Boller, the Consulting Engineer of the work, to whom we are indebted for the drawing as well as the information:

"By mutual understanding the problems involved were approached in a purely professional spirit, each commissioner being desirous of reaching a practical solution from an engineering and operating point of view, and avoiding visionary propositions that would involve such radical measures as would defeat the object for which the Commission was appointed. The conclusions reached, and the recommendations made, are fair for all parties in interest, and disturbing to the streets of Newark in an unexpectedly slight degree. The existing terminal arrangements are interfered with the least possible, and the whole scheme is so arranged as to maintain the present freight yard relations to the main lines, and to elevate the tracks at the least cost to the railroad companies, on whom at best the burden of expense will be very heavy. In the district involved not a grade crossing remains, barring Center street on the Center Street branch of the Pennsylvania Railroad, to overcome which would lead to such cost in the elevation of tracks on that street that the railroad company would sooner abandon that branch than undertake it. Should that crossing ever become more important, there is nothing in the scheme here recommended to prevent elevating the tracks on that branch at some time in an indefinite future, when conditions would warrant it. This branch at present is only used for slow speed local trains, and is of no particular value to the Pennsylvania Railroad. It



Double Spring Draft Rigging for Standard 34-foot, 50,000-lb. Box Car—Chicago & Northwestern.

each one of those springs is a double coil or single coil spring?

Mr. BRYAN: Double coil. In regard to shearing of rivets, before we put this device in service I made some pretty severe tests of shearing the rivets. I put a pressure against the back end of the forward or inner yoke of 100 tons, before showing any signs of shearing the rivets, and at 120 tons they were sheared a full thirty-second of an inch, and the yoke spread about three-sixteenths of an inch. Of course the back end of the outer yoke does not take any strain except in pulling.

From actual use during a year's service we have never found any of the rivets sheared, or any of the parts broken. We have had drawbars twisted out of the castings completely and broken off; in fact we had a wreck of 14 cars, seven of which were equipped with this attachment, and there was not any parts of the attachments broken so they could not be put back in the cars when we rebuilt them. This shows the benefit of a large bearing on the draft timbers, and the thorough manner in which they are tied together by through bolts makes it a very strong device.

Mr. WM. MCINTOSH (M. M., C. & N. W.): The Northwestern road is using a draft rigging of the double spring type, but the check castings are quite differently arranged from Mr. Bryan's; the draft timbers are quite deeply dapped on either side to receive the front ones, while the last bolt of the back pair passes through both timbers and the thimble between clamping them tightly together, this thimble also forming a stop for pin that holds the drawbar springs in place. The check straps are long enough to engage all of the check plates, thus making

a large amount of data had been gathered and that it was hoped to make a formal report next October. The Association voted to relieve this committee from the duty of formulating rules for yard brakemen.

The Committee on Safety Appliances made a report of statistics gathered by the Secretary Feb. 1, 1896, from 201 companies operating 143,116 miles of road, showing:

Freight cars in service.....	1,048,760
" " with air-brakes (29.1 per cent.).....	305,134
" " standard automatic couplers (37.1 per cent.).....	388,965
Freight cars with grab irons (96.7 per cent.).....	1,007,918
" " drawbars, standard height (93.1 per cent.).....	970,604
Engines in service.....	33,917
" " equipped with power-brakes (87.5 per cent.).....	29,057

Most of the cars not fitted are old or small, or are used in special service, such as mining. There were about 17,000 cars under contract at the time the reports were made, practically all of which were to be fitted with safety appliances.

On the report of a special committee the meeting voted to re-number the rules in the Standard Code so that the different departments of the Code shall appear under the following numbers:

- From 1 to 300—General Regulations.
- " 301 " 500—Train Rules.
- " 501 " 600—Telegraph Block.
- " 601 " 700—Controlled Manual Block.
- " 701 " 800—Automatic Block.
- " 801 " 900—Interlocking.

The main discussion of the meeting was on the Code of Rules for operating the block signal system as reported by the Joint Committee. The report of this committee, embracing a code of definitions for block signaling; of

was the old main line, which the building of the Market street cut-off in 1888 rendered unnecessary for the business of the road, and is only now maintained because it was an existing fact. It would be no hardship on the Pennsylvania Railroad to abandon it entirely.

"Two unimportant streets must be closed, it being impossible to provide for them in any consideration, viz.: Lawrence street, traversing the easterly freight yard of the Central Railroad, and Canal street, which the fixed elevation of the Canal bridge makes impossible to lower, and an overland crossing is impracticable. Taking up the streets crossing the Pennsylvania Railroad main line seriatim, I comment as follows, premising that the cuttings herein named can in most cases be modified to give greater head-room, but the head-room that I have adopted seems to me sufficient for all practical purposes.

"Poinier is the first street north of the Lehigh Valley bridge where the rising grade of the P. R. R. (at the maximum used on the New York Division) attains an elevation of 17; head-room, 12 ft., street cutting, 3.5 ft.

	Head-room.	Street cutting.
Vanderpool.....	12.00 ft.	2.4 ft.
Miller.....	13.00 "	1.76 "
Wright.....	14.34 "	"
Emmett.....	15.66 "	"
Astor.....	12.00 "	"
Murray.....	12.00 "	2.05 "
Thomas.....	13.00 "	1.25 "
South.....	To be closed.	"
Tichenor.....	13.00 "	0.39 "
Pennington.....	13.38 "	"
Chestnut.....	14.70 "	"
Oliver.....	13.00 "	"
New York ave.....	13.00 "	0.65 "
Walnut.....	12.00 "	"
Elm.....	12.00 "	"
Green.....	11.50 "	0.90 "
Trunk sewer close to surface at above three crossings.		
East Fair.....	12.00 ft.	0.12 ft.
It is understood this street is to be widened.		
Hamilton.....	12.00 ft.	1.25 ft.
Pennsylvania Railroad clearance under Jersey Central bridge, 17.50 ft.		
Market.....	13.00 ft.	4.00 ft.
Commerce.....	12.00 "	4.00 "

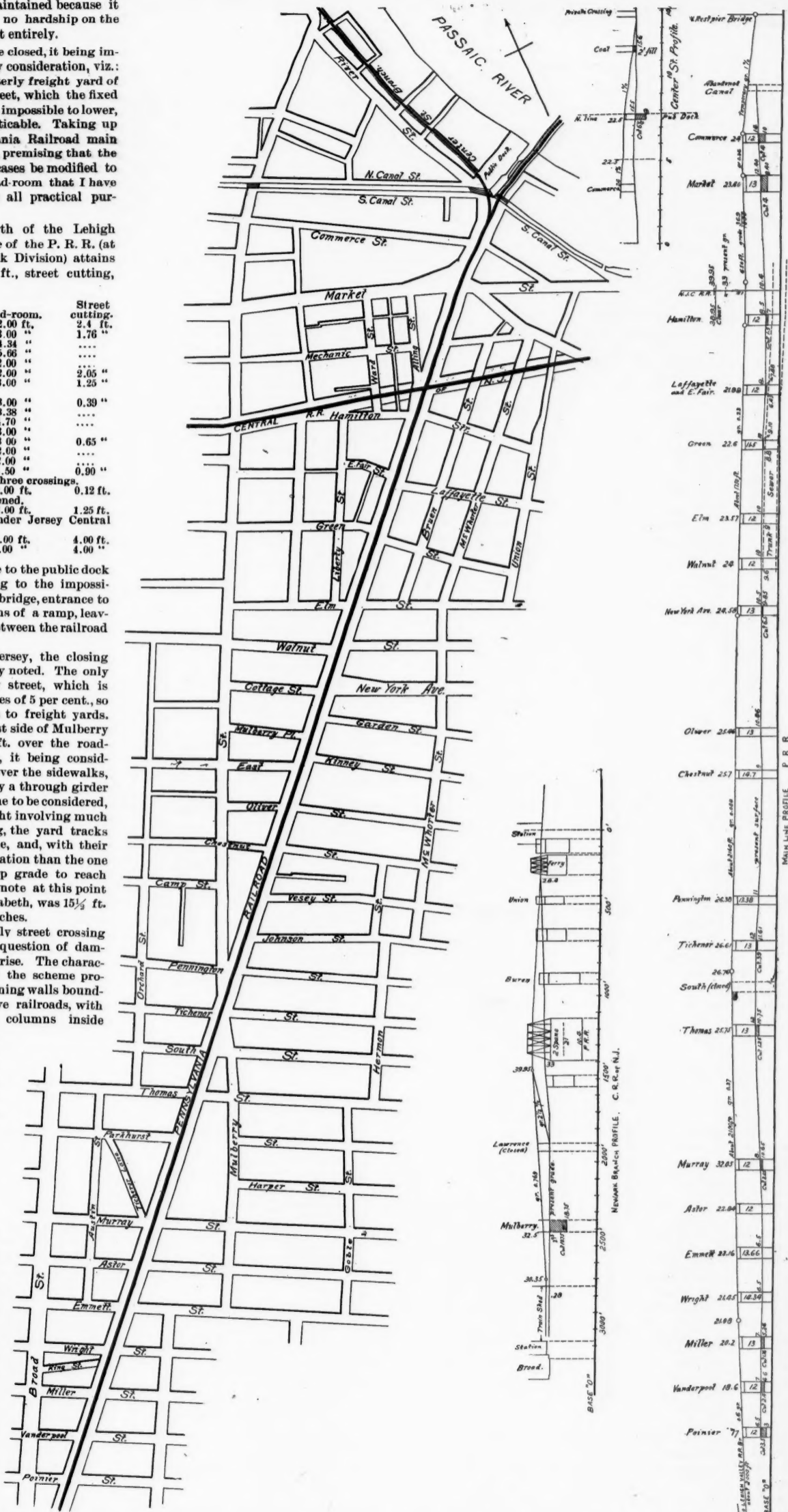
"On Center Street branch, a passage to the public dock 30 to 40 ft. wide is provided, but owing to the impossibility at present of lowering the canal bridge, entrance to this passageway must be had by means of a ramp, leaving River street on the narrow strip between the railroad and River street.

"On the Central Railroad of New Jersey, the closing of Lawrence street has been previously noted. The only other street to consider was Mulberry street, which is cut down 10.75 ft. with approach grades of 5 per cent., so as not to conflict with team entrances to freight yards. This involves the raising of tracks west side of Mulberry 3 ft., and affords a head-room of 12.50 ft. over the roadway, and 8 to 9 ft. over the sidewalks, it being considered advisable to provide deck spans over the sidewalks, while the roadway would be crossed by a through girder span. Were the passenger tracks alone to be considered, the railroad could be put up to a height involving much less street cutting, but at this crossing, the yard tracks fan out on either side of the main line, and, with their switches and cross-overs, a higher elevation than the one adopted required an undesirably steep grade to reach the yard. It may be interesting to note at this point that the cutting of Broad Street, Elizabeth, was 15½ ft. with a 5 per cent. grade for the approaches.

"Mulberry street is probably the only street crossing in the whole improvement where the question of damages to abutting property owners can arise. The character of the construction called for by the scheme proposed will be in general, masonry retaining walls bounding the property lines of the respective railroads, with abutments at street crossing and columns inside the curb lines, supporting girder spans having tight floors. An entirely new span with three trusses will have to be built over the Pennsylvania Railroad carrying the Jersey Central, in order to make a shallow flooring system, as required by the grades."

Sault Ste. Marie Canal Statistics.

The annual report of the Sault Ste. Marie canal contains some interesting statistics. During 1895 there passed through the two canals, American and Canadian, 15,063,000 tons of freight valued at \$159,575,129, about \$14,000,000 more than in the preceding year, and more than double the business of 1887, or of any year preceding that. The cost of transporting this freight was \$14,238,758, and the average distance carried was 828 miles, two miles less than in the year before, making the ton-mile charge 1.14 mill, which, with the exception of 1894, when the charge was 1.10 mill, is the lowest found in these records. Seven years ago the lowest ton-mile rate had been 2.3 mills, and it has fallen every year since then. The total ton-mileage of freight passing through the canal was 12,502,548,892, and the four largest cargoes averaged 4,222 tons; the next dozen averaged 3,500 tons.



Plan and Profile of the Tracks of the Pennsylvania Railroad and Central Railroad of New Jersey, Showing the Proposed Plan for Removing Grade Crossings in Newark.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The discussion, at the New York Railroad Club, on the improvement of the service at small and medium-sized passenger stations, which we report in another column, was one of the most practical on this subject that we have seen. The main proposition was that this service, on every road or division, should be placed in charge of some one man who can make it his chief business. It seems to us that this is eminently sound, for the most noticeable defects in this department of railroad work are due to the fact that the supervision falls to the lot of some person who has other duties which generally are more engrossing than this one. The only question is that of laying out the territory so that the officer can supervise a sufficient number of stations to make profitable use of his time. It would, however, be better to let him devote a part of his time to some other and less important work, than to go without inspection for lack of enough stations to engage the whole of a man's time. One member at the meeting objected to the establishment of an inspectorship as wasteful, but he practically admitted the argument in favor of one, for his subsequent remarks showed that he would have the same work performed by an officer with some other title—assistant division superintendent or train master. The question of titles is of little consequence, the main point being, as just stated, that the officer make the supervision of the stations his first duty; but in view of the great and varied burdens already carried by that long word "superintendent" we suggest the appropriateness of "inspector." This word is used on European railroads and in the United States army for positions like this. The word does not suggest the idea of authority, but it is easy enough to invest the place with all necessary authority, in spite of the title, or even without a title.

Mr. Haff, the principal speaker at the meeting, is particularly fortunate in having a large proportion of stations in which he does not have to maintain a water closet, or any toilet room whatever. This relieves him from a large share of the annoyances that normally attach to such a position as his. His statements apparently show that he has brought the station service of the Long Island road to a high state of efficiency; but we cannot vote him the very highest gold medal until he makes such a record with stations where a water closet has to be maintained within the building. That apartment is the main stronghold of the devil of dirt. The reduction of the number of waiting rooms from two to one was advocated by two speakers at the meeting. If the low-grade passengers can be temporarily made to behave inoffensively in a room used by women and children, this is a happy solution of the loafer question, or of a part of it; but unless there is a station inspector, and an efficient one, there is a liability that putting all the passengers in the same room will have the opposite effect; will drag the high grade down to a level with the low

grade—as far as comfort and convenience are concerned. The one-room idea ought to be carried one step farther, we think, and the main room be made to include the agent's office. We do not mean that partitions and barriers should be done away with, but that the office should be a part of the larger room as far as heating and ventilation are concerned. This helps to keep the agent up to his duty of properly ventilating the waiting-room, and relieves him and his assistant of the unhealthy conditions connected with a small workroom.

The strike of street railroad conductors and motormen in Milwaukee, which began on May 4, has developed into one of the most outrageous boycotts on record, which, up to this writing, shows few signs of abatement. Milwaukee is a city of about 250,000 inhabitants and, according to reports in the New York Times, nine-tenths of these people are in such sympathy with the strikers or are so terrorized, that they refuse to ride in the cars (the company soon got new men), refuse to patronize any merchant who rides in a car or who has any dealing with a "scab" and try to extend the boycott even to drummers who come to the city and innocently board a car according to their previous custom. Even professional men are afraid to ride in a car for fear the act will affect their business. Hacks, carriages, express wagons and all manner of vehicles are running, carrying passengers at five cents each, and they are crowded. There has been considerable stone-throwing, vitriol-throwing and other violence, but not so much as is usual in strikes of this kind. On Saturday last, after three weeks of this reign of terror, the produce commission merchants gathered courage enough to formally declare that they would sell goods to whomever they saw fit and to ride in the street cars as much as they pleased; but action of this kind seems to have been taken with great trepidation and the savage attitude of the great majority of the people continues. On Monday last the Merchants & Manufacturers' Association passed resolutions declaring that the people of Milwaukee are under "a reign of terror unlike anything in our history," and the Mayor issued a proclamation urging all persons to aid in restoring former conditions. The Milwaukee Street Railway Company ran cars on May 24 for the first Sunday since the strike began; but, in spite of the resolutions of the Merchants' Association and the official appeal from the Mayor, 240,000 of the 250,000 inhabitants "shunned the cars as if they were pesthouses on wheels." The New York Times explains this remarkable state of affairs by the statement that (1) two-thirds of the people are "wage-earners," meaning persons of the social grade below that of "clerks" and (2) that the street railroad company has lately driven a sharp bargain with the city, by which it evades paying a fair tax. The strike was for a small increase in pay and for "recognition of the Union," but the boycott has thrown these questions into the background, of course. The paramount question now is whether individual citizens, disagreeing with the majority, may have the right, in the streets of their own city, to life, liberty and the pursuit of happiness.

Rapid Transit in New York.

For some years it has seemed to us that the attempt to get rapid transit in the city of New York was being made along wrong lines—lines that could lead only to delay and disappointment or to disaster, possibly to delay, disappointment and disaster. This attempt belongs to the class of matters to which we can give only limited space and attention, consistently with the theory on which this journal is conducted. The financial and social interests involved are very great; the engineering problem is one of the first magnitude; yet, these interests are, after all, quite local, and the engineering questions are of a sort that cannot come up often or in many places. Therefore, it has not seemed proper to give a great deal of our space to this subject.

Yet, for two or three years we did try to direct that small, but very enlightened and powerful body of opinion which we can hope to influence slightly, in the right way. By all odds, the quickest and the cheapest way to improve the means of rapid transit in city of New York, the way which will give the people of the city the most agreeable and the most useful service, is in the systematic development and improvement of the existing elevated railroads. The plan of building an independent, underground system raises immense difficulties—legal, financial and engineering. Every year that passes adds to the doubt that such a system can earn interest on its cost. These facts and opinions we have developed from time to time, in various ways.

For several months we have felt that discussion of

this matter was out of place, for two main reasons: First, the underground enterprise was in the hands of able, upright and public-spirited men; we did not care to seem to put any obstacles in the way of the Commissioners and their engineer, however slight that obstacle might be. Second, further discussion was useless. The great body of public opinion in New York (if we may accept the daily newspapers as speaking for the public) had settled down into a condition of unreasoning and unchangeable prejudice against the Manhattan Railway Company. To argue with this prejudice was to waste one's breath. The chances seemed to be, very largely, that the underground project would be killed by the logic of events. The Supreme Court would decline to approve it; or the act would be found unconstitutional, or responsible contractors would not take up the work under the terms of the Act.

The Rapid Transit Commissioners have had their chance, and their plan has been killed by the Court. Precisely what has happened is this:

The Rapid Transit Commissioners selected a route and prepared a general plan, and then having failed to obtain the consent of the property owners applied to the General Term of the Supreme Court for the appointment of commissioners to report whether or not the railroad proposed by the Board should be built and operated. These commissioners reported last March in favor of the route and plan of the Board of Rapid Transit Commissioners. It then became the duty of the Appellate Division of the Supreme Court to pass upon the report of the commissioners who had been appointed by the General Term, and this is what the Appellate Division has now done. Two opinions were written, one by Justice Van Brunt and one by Justice Rumsey, both of which are concurred in by all of the five justices and both of which are adverse to the plan of the Rapid Transit Commissioners.

Justice Van Brunt sets forth the fact that the commissioners appointed by the General Term said that any conclusion to which they could come in respect to the probable cost of the Rapid Transit Commissioners' railroad would be mere conjecture, therefore, they set aside entirely the question of cost. This, says the Justice, "is the first time, we think, in the history of any great enterprise that the question of practicability did not include the consideration of cost." If the question of cost was not to be considered by these commissioners, it is difficult to see what question was before them.

It has been urged that the property owners cannot raise objection as to cost, as they have no interest in that question. This, in the opinion of the Judge, is a fallacy. The only justification for interference with the rights of abutting owners is that the railroad can be completed within a reasonable time. If, through financial difficulties the building of the road may be greatly delayed and possibly abandoned entirely because of the wreck of the finances of the city and of the intervention of constitutional prohibitions, it is manifest that great injury will result to the property of abutting owners for which they can never be compensated. But it is difficult to see how the city can provide money to meet even the engineer's estimates of the cost of the work, considering the constitutional prohibition against the creation of debt above a certain limit. If the work was commenced it would be impossible for the city to raise funds to finish it, and work must cease, although the railroad is unfinished and useless.

It may be argued that the commissioners will take sufficient security from the contractors, but if the commissioners cannot tell whether the road can be built for 50 million dollars or 90 million dollars, on what basis can security be fixed? The money for the enterprise must be furnished by the city, the risk is that of the city, and unless the road can be built for an amount substantially less than the engineer's estimate the work must stop and the city would not have the right to borrow money enough to put the streets in the condition in which they were before 50 million dollars had been sunk in a vain attempt to carry out the plan.

Another feature to which the Justice calls especial attention is that the act provides that the city shall secure the contractor in building and working the road from all claims or interference, whether by injunction or suits for damages or otherwise, on the part of abutting owners. This is a condition impossible of fulfillment. The city cannot prevent interference by injunction. That is a question that lies with the courts and not alone with the state courts; there are cases without doubt in which the courts of the United States would have jurisdiction to act. Furthermore, legal proceedings would be undertaken that would interfere with the progress of the work, and if delayed by those which the city cannot prevent, the contractor might be relieved from his contract with the work half performed.

There is no restriction upon the Rapid Transit Commissioners as to the amount they can render the city liable for. Such power was never before given to any board or body, and with it the Board might involve the city in obligations that would ruin its credit and stop all other public improvements.

The probabilities indicate that after sinking 51 million dollars without being able to complete the work, the enterprise would have to be abandoned, since no legislation could afford any relief.

Such, very briefly, is the gist of the opinion of Justice Van Brunt. The opinion by Justice Rumsey, proceeding on somewhat different lines, comes to precisely the same conclusion. He dwells upon the injury to Broadway during the work. He says that the engineer states that a mode of construction could be adopted that would prevent disastrous interference with the business of Broadway; "but the fair inference from his testimony is that if such a mode of construction is adopted the cost of the road will be increased by a very large amount." Hence, the amount at the disposal of the city being limited, it would be impracticable to use those means. While the road was in process of construction, business on Broadway would be seriously diminished, which would cause great loss in business profits and in rental value, and the evidence is that it would require upward of three years working night and day to build the road from the Battery to Fourteenth street.

If there were miscalculation as to the cost, and if the contractors were unable to finish the work, or comply with the terms of their contract, the city would be compelled either to permit the work to be unfinished or to finish it by direct taxation, because having reached the constitutional limit of indebtedness it could not borrow money. But further, considering the question of cost, the first thing that impresses the Court is that after all the investigation which the Court Commissioners have made they are unable to come to a conclusion as to the probable expense. The scheme has not been sufficiently worked up to enable the engineer to say what it will cost. The scheme as presented is tentative; the details are not worked out; the mode of making the excavation, the greater part of the expense, is not settled upon. With regard to the security of buildings there is serious conflict of testimony.

But, if we assume that the cost of the enterprise will be only that which is estimated by the Rapid Transit Commissioners, that is, 50 million dollars in round numbers, no estimate is made for payment of damages, for the expense of acquiring property in fee for the incidental uses of the road, or for the contingent liability of the city arising out of the requirement that the city shall secure the contractor against claims or interference by injunction or suit for damages or otherwise. The extent of that liability may be something appalling. It cannot be estimated, but must be taken into consideration. But if we take simply the estimate of the engineer and add five millions of bonds, which must be issued to pay for the acquisition of property their plans involve the necessity of raising upward of 55 million dollars in bonds. The city is not now in a situation to incur such indebtedness. The actual debt now in existence, not including outstanding obligations, is over 100 million dollars. The limit of the constitutional power to incur indebtedness is \$164,600,000; but outstanding obligations have consumed a considerable portion of the margin left. Bonds which the city must issue for these obligations will amount to more than 19 million dollars, leaving only 36 million dollars that can be issued for the new rapid transit railroad. When that amount is consumed all expense beyond, however enormous, could be met only by taxation. For any other public enterprise no indebtedness can be incurred. If it should be necessary to build schoolhouses, or to improve the water front or to repave a street each of these things could be done only by direct taxation. "In view of the fact that the road when built will not furnish a complete system of rapid transit from one end of the city to the other; that it is doubtful whether any large portion of it can be built with the money now at the disposal of the city, and that it is certain that the expenditure of the vast sum of money even now authorized by the Legislature will take away the power of the city to engage in any other public work, however necessary, and may possibly so impair its credit that it will not be able to recover in the course of many years," the motion is denied.

From the decision of the Court there is, we understand, no appeal. What will happen next? This is mere conjecture. One suggestion that is made is that new and independent lines of elevated railroad should be built by the city, east and west of the existing elevated railroads. This could be done for much less than the proposed tunnel road, and the cost of doing it could be quite exactly known beforehand. But would

such new roads fill New York's needs, and would they earn interest on their cost? Probably they would do neither.

Such lines of railroad would be out of the belt of great travel. They would get a considerable long distance traffic, but that would be a trifling part of the amount that the roads would have to earn to pay working expenses and interest on their cost. The profitable traffic is the short distance traffic, using the seats several times in one trip. These east and west lines could get but a small share of the short distance traffic which is necessary to the prosperity of any line of costly city railroad. Moreover, within the last two or three years conditions have changed by the development of the surface roads. The competition of the improved surface roads has already become serious. The total numbers of passengers carried by the Manhattan elevated system each year for the last five years is as below: In 1891, 196,714,199; in 1892, 213,692,743; in 1893, 221,407,197; in 1894, 202,751,523; in 1895, 188,072,645. It is true that the falling off cannot be attributed entirely to the competition of the surface lines. Part of it is doubtless due to hard times; but it is safe to assume that a considerably greater part is due to the improved service given by the cable and trolley roads, and the development of these improved surface systems is not yet at an end. The substitution of mechanical motors for horses and the merging of detached lines into great systems with sufficient cars, reasonably good speed and free interchange will continue to draw off more and more of the short traffic business from any elevated railroad or underground railroad either now built or to be built.

The Rapid Transit Commissioners realized very well these vital points. They realized that their line must be laid along the center of travel and of business. They found no place between Sixth avenue and Third avenue for elevated railroads. Thus they were driven to the underground scheme if they were to be independent of the Manhattan Railway Company. Assuming that they were obliged to be independent of the Manhattan, they probably did as well as they could. We do not question their wisdom in taking the Broadway underground project, always assuming that no reasonable arrangement could have been made with the Manhattan Company. A set of conditions existed which the Commissioners could not control. This was a great misfortune for the city, for it has postponed improvement in New York's rapid transit system for years.

Now the Broadway tunnel plan is ruled out of consideration. Because of the reasons which we have given above, the plan for independent lines of elevated railroad east and west of existing lines appear to be ruled out. The Commissioners could find no route for an independent line of elevated railroad between the existing lines. Then what remains? What remains is what was apparent from the start—an arrangement with the Manhattan Railway Company, and talk of the possibility of such arrangement began immediately when the decision of the Court was known. But what were the conditions which prevented this arrangement being made at the first, and do they still exist?

On one side is the policy of the elevated railroad company itself. The illiberal spirit of one or two strong holders in that company has long been a great obstacle to its proper development. It is apparent to anybody who studies the matter that an increase of mileage and an increase of the capacity of the existing structures and plant will increase fixed charges and working expenses in greater proportion than they will increase the revenue. Hence, there was no immediate financial reason for the owners of the elevated railroads to spend large sums in such improvements. Their only great object would be to forestall competition, and that has seemed to be remote. But even the more liberal of the directors of the Manhattan Railway Company have been confronted by serious reasons for not wishing to increase their investment. They have been confronted by the constant threat of a new and independent rapid transit system, by the certainty of the development of the surface lines, by the certainty of heavy damages to be paid to abutting property holders, often unjust although perfectly legal. Here was a set of formidable obstacles to be overcome in the counsels of the elevated railroad company itself.

On the other hand, there has grown up a prejudice against the Manhattan Railway Company. For this the editors of the daily newspapers of New York are largely responsible. They have persistently ignored the good points about the elevated railroads. They have refused to learn and refused to let their readers know what a remarkably good service the elevated railroads have given to the city. A couple of years ago we made some careful comparative studies of the elevated railroads of New York and the underground

railroads of London, these being the only two great metropolitan systems that could be considered comparable. We found that the London railroads have nearly twice as many miles of line as those of New York, while the New York railroads carry 47 per cent. more passengers. In frequency of service the New York roads were greatly superior. Taking two typical stations in the heart of each city we found that for passengers going four or five miles there were twice as many trains in New York as in London. For passengers going nine or ten miles there were fifteen times as many. Frequency of stations is another important item in public accommodation. Taking in each case a distance of about 11 miles we found twice as many stations to the mile on the New York road as in London. We found also that, notwithstanding the greater number of stops, the speed on the New York roads is higher than in London. We found that taking the whole length of line in each city and the whole amount of train mileage, the public service in New York was equivalent to 345 trains a day each way over the whole system; in London it was equivalent to 56 trains. We found also that the fares in New York are lower than the lowest third-class fare in London if one rides a distance of three miles or more. In London the distance must be considered, as fare is paid according to distance traveled.

Such facts as these, as we say, the newspapers of New York persistently declined to make known to their readers. On the contrary, they have dwelt persistently on the drawbacks. They have complained bitterly of occasional delays in fogs or from accidents, ignoring entirely the remarkable safety and regularity of the service. The grievances, real and imaginary, of the people of New York against the elevated railroad company have been kept prominently before the public, the benefits received have been carefully ignored, and thus grew up a situation which was difficult to compromise.

At last the stage in the affair has been reached to which we have looked forward for several years. The elevated railroad can now by a liberal and public-spirited policy rid itself for years, perhaps for a generation, of the one thing that has been the most serious threat to the value of its securities, the threat of an independent system. The city can now by a liberal and public-spirited policy, get an improved rapid transit service at no cost to the taxpayers and in less time than it could be got by any other means. Will the strong and broad-minded men now take control on both sides and bring together the conflicting interests and speedily find the simple way out of the tangle? We shall be very much surprised, but very much pleased, if they do.

The Rapid Transit Commissioners, of New York, have said, in an address to the public, that they are now forced to abandon the hope that any adequate solution of the Rapid Transit problem under the existing law is possible. They might, perhaps, help matters through contracts with existing companies, but so far they have received no overtures from any existing company. We are inclined to think that they will receive such overtures in due time, but apparently the Board does not encourage them. The counsel to the Commission is reported to have said that if "the Manhattan comes in the proper spirit its proposition will be considered carefully." This is a very clear expression of the attitude that some of the Rapid Transit Commissioners and their counsel have long taken in this matter; an attitude that is a good deal more partisan than patriotic. Who ever constituted the counsel of the Commission a judge of the spirit in which the Manhattan Company should approach the Commission? What are his notions of a proper spirit? We suggest that until the Commissioners are prepared to receive propositions in a proper spirit, propositions to them are useless.

Several newspapers last week printed dispatches from Washington describing in detail an alleged scheme on the part of the Seaboard Air Line Railroad to defraud the government by unduly increasing the weight of the mails carried over that road during the month (March, 1896) in which they were weighed for the purpose of readjusting the rate of compensation to be paid by the government to the railroad for their transportation. It is said that 300 sacks of documents, franked by a United States Senator, were sent to various station agents along the road, there to be re-mailed to addresses furnished by officers of the road. It is alleged that 15 sacks sent to the General Superintendent of the road were re-addressed in the railroad building by employees of the road and re-mailed the following morning. The "padding" of the mails was discovered and the post office department ordered the weighing to be continued for 30 additional days; and then, it is said, the railroad company adopted the device of ordering large numbers of daily papers sent over the road. A Portsmouth paper received an order for 6,800 copies daily for 10 days, and smaller orders thereafter. A similar order was given at Raleigh, N. C.; and at Atlanta, Ga., 2,000 copies were ordered from a daily paper. With another paper

arrangements were made to send 5,600 copies of a Sunday issue weighing over half a pound each. City directories of Norfolk and Portsmouth were used to get addresses for these papers.

NEW PUBLICATIONS.

Roads and Pavements in France. By Alfred Perkins Rockwell, A. M., Ph. D., formerly Professor of Mining at the Sheffield Scientific School and at the Massachusetts Institute of Technology; 12mo, 108 pages, with illustrations. New York: John Wiley & Sons, 1896. Price \$1.25.

Mr. Rockwell's little book is partly the result of personal observation, but mainly a compilation from the publications of Monsieur A. Debaue, Chief Engineer of Bridges and Highways, and from the official documents of the French Government. It is the hope of the writer to help the cause of highway improvement in this country by giving this account of the stone roads in France, where highly educated and able engineers have been building and maintaining roads for more than 100 years.

A short chapter is on Material, describing the material mostly used in France, with a statement of its relative value and the method of preparation. This is followed by a chapter on Construction. In France the tendency has been to do away with the foundation and to reduce the thickness of the metal, making it only so thick as is necessary to give sufficient resistance. As early as 1764 Trésaguet introduced great improvements in construction, which 10 years later were generally adopted in France. The stone roads at that time were generally from 18 to 22 in. thick in the middle. Trésaguet reduced this to 10 in., making the thickness uniform. He put in a foundation of somewhat large stones laid by hand on edge. He covered this with layers of smaller stones also laid by hand, and then spread a layer of three inches of stone broken to about the size of a walnut. This system was used in France until about 1820, when Telford's modifications began to prevail.

In Telford's early practice the foundation stones were laid 9 in. deep in the middle and 5 in. deep at 9 ft. from the center. These were laid on a horizontal bed and covered with a layer 6 in. thick of hard stone, broken to pass through a ring 2½ in. in diameter. Telford's earlier method has been more or less modified, but the characteristics remain the same. Mr. James Owen's roads in Essex County, N. J., were built on the Telford plan, with 8 in. of foundation and 4 in. of broken stone. Later he has recommended for ordinary highway purposes 5 in. of foundation and 3 in. of broken stone.

In 1816 Macadam introduced his method in England. This went to France and for many years it has been used exclusively there on all the public roads. The macadam metal is used in France from 6 in. thick up to 10 or more. There are 22,000 miles of "national roads" in France, which are the heaviest. The lighter-roads are classified as "department roads" and "subordinate roads." By actual examination of the national roads made in 1891 to ascertain the thickness of the metal, 500,000 tests showed the average thickness of roads without foundation to be 5½ in. Almost 7 per cent. of these roads without foundation had metal less than 2 in. thick; 27½ per cent. were covered with from 4 to 6 in.; over 20 per cent. were from 6 to 8 in. thick, and over 15 per cent. from 8 to 12 in.; about 4 per cent. was above 12 in. in thickness. About ⅓ of the total length of the national roads are less than 4 in. thick, and 4 in. is the limit below which it is thought unsafe to go.

Under the topic of Binding Material Mr. Rockwell says that some of the best engineers consider the point now well settled that, other things being equal, a roadway is so much the better the less fine material it contains. When the broken stone has been thoroughly compacted under a heavy roller, and not until then, a layer of screened gravel, free from clay, one-third of an inch thick, should be spread over the surface. Clay or loam is especially objectionable when subject to alternate freezing and thawing.

The chapter on Maintenance and Repair is an important one. Two quite distinct methods are followed in France. What may be called the method of patch-work repair is still employed upon nearly one-half of the national roads, but is being replaced gradually by the other method, that of general recharging. This, the more modern method, is favored where it can be applied, but it necessitates the use of a horse or steam roller. Both methods are described at some length. Sections of typical French roads are given, the types being taken from different departments.

The admirable practice of planting trees along the highways has received much attention and care in France. The shade is not only agreeable to the traveler but is valuable in preserving the roadway during periods of dryness. The method of planting is influenced by the width of the road. On many of the old national roads, laid out originally 65 ft. wide, there are now broad turf margins with double rows of trees on each side. In general, where the roads are 50 ft. or more wide, there are two rows of trees 10 ft. apart.

There are in France 321,803 miles of stone roads of the various classes, and the annual expenditure for maintenance, including improvements and repairs, is \$31,552,000. These figures represent the outlay for materials and labor on the roadway proper. About 45 per cent. must be added to cover expenditure for watercourses, sidewalks, planting of trees and general administration.

The book ends with a chapter of about 40 pages on the pavements of Paris. There are 10,500,000 sq. yds. of street pavement and 8,250,000 sq. yds. of sidewalks,

alleyways, etc., all under the same direction, and the expenditure for 1893, exclusive of salaries and of the cost of new construction, amounted to \$4,900,000. All of the wood, asphalt and a portion of the block stone pavements of Paris are laid on a cement concrete foundation; 71.5 per cent. of the pavement is of block stone, 16.3 macadam, 3.8 asphalt and 8.4 wood. We had supposed that the percentage of asphalt was much larger than this. The tendency to-day is to substitute asphalt and wood, mainly wood, for block stone and macadam, and especially for macadam. In certain outlying parts of the city macadam will still be retained, but the use of wood is decidedly on the increase. Asphalt has the advantages found in the wood pavements of smoothness, quietness and ease of cleaning, but it has the disadvantage of being more slippery when wet. All of the Paris wooden pavement is laid on cement concrete foundation 6 in. thick. The wooden blocks are generally 6 in. deep and have an exposed surface of 9 × 3½ in. They are placed in rows with a space of ⅞ of an inch between, and these spaces are filled, first with 1 in. of hot coal tar, then 5 in. of cement and sand. The wood first used was Norway spruce and later resinous pine from the south of France has been used. Pitch pine from Florida is considered more durable and is used to a limited extent.

The Year Book of the Society of Engineers of the University of Minnesota, Minneapolis, Minn.

Following the fashion now so common in many technical schools, the Society of Engineers of the University of Minnesota issues an annual made up of miscellaneous papers. The pamphlet issued by this society is 130 pages, large octavo size, and contains 18 articles, most of them short, together with a list of members of the Society, including undergraduates and alumni.

The paper of greatest interest to our readers, perhaps, is by Professor H. Wade Hibbard, on Railway Mechanical Engineering. A general view is given of the work of the mechanical engineer on the railroad and of his future, and the method of preparing him, so far as the schools can prepare him, is discussed.

Another paper of considerable importance is on Fire-proof Floors in Modern Buildings by Mr. F. L. Douglas, who describes at some length the various types and systems in use. This is a convenient summary of practice.

Another paper worth notice is on Irrigation Engineering in the United States, by Mr. C. H. Kendall. He gives an interesting table showing the extent and cost of irrigation. From this it appears that in the United States the irrigated crop covers 3,564,000 acres. The area of irrigated crops is about one-half of one per cent. of the total land area. In Colorado, where it reaches its maximum, it is 1.34 per cent. The average first cost of water per acre for the United States is \$8.15; in California it runs up to \$15.84 and the lowest price is found in South Dakota, where it is \$3.20. The average value of water per acre as estimated by irrigators is \$26 for the United States; in California it is \$7.59. The average annual cost of water per acre is 90 cents; in California \$1.60, in North Dakota 25 cents.

A short paper by Professor Frank H. Constant discusses the strength of concrete and steel in combination. The discussion is theoretical. We do not discover in it any mention of actual tests of such composite structures.

TRADE CATALOGUES.

Manila Rope for Transmission and Hoisting.—The C. W. Hunt Company, 45 Broadway, New York, issues as an advertisement a little pamphlet of 36 octavo pages, which is described as "a brief treatise for engineers on ropes used for the transmission of power, together with formulæ, tables and data useful in mill engineering." The description as given in the above sentence is a proper one. It is a treatise and a brief one, and it does contain much information useful in mill engineering. The materials and methods of making manila rope are briefly described. There is a useful chapter on splicing and another on knots, and there is a discussion, with tables, of the use of rope for transmitting power and for hoisting. The pamphlet is illustrated with a number of useful and interesting engravings. An appendix reproduces a paper on rope driving written by Mr. Hunt for the American Society of Mechanical Engineers, and reprinted from the *Transactions*. Another appendix gives figures derived from trials to ascertain the power for rope and belt transmission reprinted from *Engineering*. Still another appendix gives result of tests to ascertain the loss due to the power required to bend the ropes of hoisting tackle around sheaves made for the U. S. Navy by Dr. Robert Grimshaw.

Contractors' Material and Railroad Supplies.—The H. Channon Co., 24 and 26 Market street, Chicago, issues a handsome catalogue of 246 pages, 7 in. × 10 in. in size, in flexible boards. The catalogue is profusely illustrated and has comprehensive tables of sizes and prices. The material covered is rope and cable, tackle, hoisting machinery of all sorts, together with wrenches, shovels, picks, hammers, barrows, blacksmiths' supplies, axes, files and saws, bits, drills, taps, dies, screws, bolts and nuts, and a good many other things.

The Phosphor Bronze Smelting Company, 2200 Washington avenue, Philadelphia, Pa., issues Price List No. 10 for 1896. It is a very small book, but covers a large variety of material, including roll and sheet metal, wire of various sorts, wire rope, nails, rods, bolts, nuts and

washers, wood screws, ingots and castings, alloys and anti-friction metal.

Mannocitin.—Mr. Otto Goetze, of 114 Broad street, sends us a little pamphlet on the rust preventer called Mannocitin, for which he is the American agent. The pamphlet contains a brief statement of what the compound is and what it does, but is mostly made up of opinions from those who have used it, which opinion are very favorable.

Electric Railway Overhead Line Material.—The Creaghead Engineering Co., Cincinnati, O., issues a catalogue of line material for electric railroads. This covers pretty much everything, including brackets, insulators, clamp ears, bonding pins, wire and numerous small parts. Illustrations and prices are given.

Rubber Goods.—The Boston Belting Co., 256 to 260 Devonshire street, Boston, and 100 to 102 Reade street, New York, has issued a catalogue of date of April, 1896. The product of this concern covers a great variety of rubber goods, including belting, hose, packing, gaskets, etc.

The English Railway Clearing House.*

(Concluded from page 364.)

This could not possibly be done without the so-called Mileage (car tracing) Department, which is enabled to trace by the wagon numbers given in the station returns, the exact route by which the goods have been conveyed when the same vehicles have been used from end to end, but in cases where small lots of goods have been trans-shipped at various points on the journey, the Clearing House is guided by the marks of trans-shipment as stamped on the original invoice.

The rules governing this department, as in those governing terminal charges, are innumerable, but classified and arranged in such a systematic way that any experienced clerk can turn to them and make correct entries from them without the least difficulty.

Second. The passenger department, which undertakes to settle the accounts of all interchanging traffic, animate and inanimate, conveyed by passenger trains. This includes men as well as horses and dogs. Cattle and menagerie animals belong to the freight department.

Inasmuch as the agent selling a ticket reading over more than one line always collects the entire amount, and all the canceled coupons and tickets taken up by conductors are delivered up into the Clearing House, settlements from that class of traffic are less complicated, except in special cases, as when there are elections to Parliament where candidates are authorized by roads to issue orders entitling voters to travel to and from the polling place free of expense, this being a practice authorized by Parliament, and where railway companies generally make special arrangements with candidates, but all such arrangements must be reported to the Clearing House. The Clearing House always charges the selling agent with the full amount of the fare received, either on the basis of an agreed rate per mile, or, where no such agreement has been reported to it, by dividing the amount received with the total mileage over both lines and debiting the line which sold the ticket with the proportion which belongs to the line which carried the passenger over part of the route. The average rate charged for passengers is four cents per mile for first-class, three cents for second-class and two cents for third-class.

Third. The Mileage Department: The principal work of this department is the recording of the numbers and the tracing of each individual vehicle from the time it leaves until it returns home, the careful noting of the exact route traveled and the time occupied in running the respective distances. It deals with the rolling stock of every company whenever it passes from the parent line, watches and records its progress and return, and apportions the charges accruing from its use. For this purpose it employs at every junction point, of which there are several hundred, a certain number of "markers," whose duty is to examine and note each train passing, sending an exact return to the general office of the number and description of each vehicle, the nature of the traffic, with the date, time, forwarding station, route and destination. All charges for detention and misrouting, or what is known as demurrage accounts, are rendered to the companies monthly and all charges for mileage are settled the same as freight and passenger revenues on balances.

Fourth. The Loss and Damage Department is carried on on a similar line with the others, but one is astounded when reading the reports at the rapidity with which lost goods are traced, forgotten passenger parcels recovered and returned, and how the actual total of losses is reduced to a minimum through the admirable system adopted.

It remains only to show, in a general way, how the system operates. For purposes of division, the Clearing House receives from every station on every line:

1. A monthly report of the entire freight dispatched at the station, where from, where to, the initial of the car and the car number, what charges, if any, attached thereto for drayage, loading, etc., whether the freight is deliverable to consignee at the station or at his premises, and whether charges are prepaid or collectible.

2. A monthly report of each ticket sold, the number thereof, the initial and terminal point, the class, amount received, and the lines over which ticketed.

3. At the receiving station the same kind of report is made of goods received, which must tally precisely with the report of goods forwarded. All passenger tickets collected by conductors on trains are sent to the Clearing House, there assorted and compared with the report of the selling agent, and unless the reports of the selling agent correspond with the tickets received, or unless the report of freight received corresponds with the report of freight forwarded, the Clearing House at once sets about to trace inaccuracies, settles with the roads for all accounts that tally and leaves the accounts that do not tally until the next settlement when everything is cleared up.

4. All companies, parties to the clearing system, are required to give to the Clearing House security for the due payment of Clearing House balances to such amount and in such shape as the Superintending Committee may order.

5. The bankers of the Clearing House are supplied with the names of the companies parties to the clearing system, and are instructed to make no payment to any railway company not included in the list. Payments on account of balances are made as soon as sufficient money to transfer is paid into the bank by the companies' debt-

* From an address by Dr. William Taussig.

ors to the Clearing House, each creditor of the Clearing House receiving a ratable share of the whole amount paid according to the sum standing to its credit in the Clearing House ledgers. Interest at the rate of seven per cent. per annum is charged on balances owing to the Clearing House, and in the event of the Clearing House failing to obtain the payment of Clearing House balances, and the security is insufficient to cover the same, the loss thus sustained is borne by the companies interested in the respective group of traffic upon which the loss arises. Expenses are divided into general, mileage and traffic departments. The general expenses are distributed among all lines ratably. Expenses of the mileage and traffic department are distributed over lines according to the groups which they form and in proportion to the traffic, mileage and receipts over those lines and within their respective groups.

There are innumerable provisions in the rules relating to division of receipts, of expenses, payment of balances, etc., and the above is simply intended to give an outline of the system in general.

The total gross railway receipts in the United Kingdom in 1894 amounted to £84,310,831, of which £30,000,000, or about 37 per cent., passed through the Clearing House in settlements. These figures show best the enormous task of which it relieves its members, the railways.

The exterior of the building in which this vast volume of business is transacted is as insignificant as its interior arrangement, though spacious and admirable in its practicable arrangements, is unpretending. Nobody would imagine, when simply looking at the long, dingy, two-story row of houses on Seymour street, adjoining the Euston Station, that it is here where the pulse of the entire railway organism of the United Kingdom is counted. While passing, at the side of an assistant of Mr. Rider, the gentlemanly Assistant Secretary to whom I am indebted for many courtesies, through the halls and offices, where the thousands of clerks are seated at their work, I could not but admire the cleanliness and comfort, the compactness and the practical severity of the arrangements, and when the locations of the divisions, one leading to the other, all complementing themselves in the ultimate results, was explained to me, I could readily understand the exactness of these results.

The question now presents itself whether, conditions and circumstances being alike, and the ills from which the railways in England suffered 50 years ago having been precisely those from which ours suffer to-day, a similar institution could not be successfully carried out in our country to the inestimable benefit of the roads and the people? In my humble judgment there is no doubt about it. It has indeed already been tried, and, in a measure, successfully. The Southern Railway and Steamship Association was organized in 1873, embracing nearly the whole railway system of the South and all steamboat lines competing with them, mainly for the purpose of fixing and maintaining rates and the pooling of the joint receipts, but soon after its establishment it also adopted the plan of clearing all through traffic accounts. This it did successfully, under the organizing genius of Albert Fink, as long as it lasted, and until Mr. Fink was called to New York to preside over the Trunk Line Pool Association. Both it and the Southern Association failed, because they were merely voluntary combinations without power to enforce contracts, without standing in law and without any other cohesion but that of loose resolves. They were, like their recent successors, tied by pledges of mutual honor, and this tie proved to be a rope of sand. Had they been recognized and incorporated by the State or General Government, with powers, obligations, restrictions and limitations clearly defined, they would have lived, and lived to usefulness.

The former Southwestern Railway (so-called Gould) System, comprising the Wabash, the Missouri Pacific, the Iron Mountain, the Texas & Pacific, and other lines, operated a clearing house under the able management of its then Auditor, Mr. Warner, now Vice-President of the Missouri Pacific Railway, for the entire system, successfully for several years and until its disintegration a few years ago. I am informed that the disintegrated roads employ now over 2,000 clerks to do the work that 600 performed while the clearing for all was in effect.

There ought to be no difficulty in obtaining a charter from the General Government for a corporation, the declared object of which would be only a method of accounting that conduces to economy, convenience and honest dealing among its members. This country is too vast in extent for one such clearing house, but it may be easily divided in groups, on geographical and topographical lines, each of which could first do the clearing within its own lines, and then the groups do the clearing among themselves. Such an association, or system of associations, would not only at once benefit the roads, through unification of action, in the way the English roads are benefited, but it would shortly cure the evil of rate cutting, the bane and the insidious malady under which our railway organism is wasting. It would cure it by laying the ulcer open, for, while the clearing house does not determine rates or interfere with them, by the nature of its working no secret rate could be made without immediate detection, and secret rates, like dark deeds, shun the light.

We all know what lasting benefits have accrued to our railroads from unity of action in their mechanical and physical departments in agreeing upon common gages, common construction of equipment, brakes, couplers, etc., as brought about by the Master Car Builders, Master Mechanics and other department officers in their conventions. Why should not this unity of action be also brought about as to accounting, and eventually why not as to rates?

The establishment of such a Clearing House, sanctioned by the Government, would be only the first step to the establishment of other authorized associations, acting under rules and stipulations, regarding rates, territorial divisions, extent and limits of power, prescribed by the Government and under the healthy supervision of the Interstate Commission. These will then be able to accomplish, under provisions of law, what the Joint Traffic Association, recently formed in New York, and similar ones in the West, endeavor to accomplish by moral force, and the force of protection of self-interest.

Freight Car Truck "No. 4 B" of the Baltimore & Ohio Railroad.

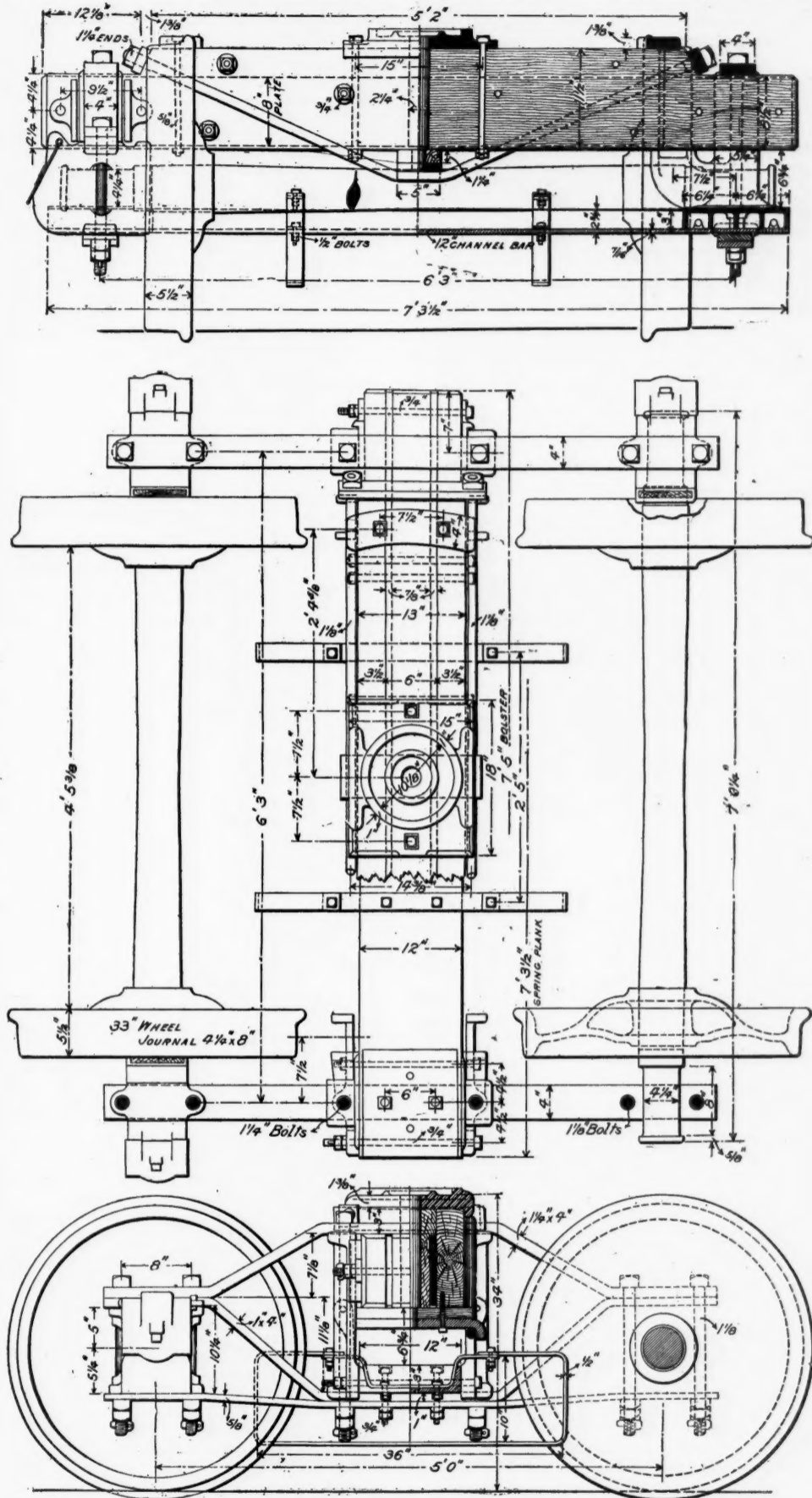
A few weeks ago (page 301) we gave some account of the freight cars to be built for the Baltimore & Ohio Railroad. The trucks specified for those cars are of the style known on the Baltimore & Ohio as No. 4 B. Engravings showing the truck in detail are given herewith and a description taken from the specifications follows.

The wheel base is 5 ft.; the distance between centers of journals is 6 ft. 3 in., and the journals are 4 1/2 in. x 8 in. The bolsters are of the compound type, made of three pieces of white oak; outside pieces 3 1/2 in. x 11 1/2 in. and center pieces 6 in. x 11 1/2 in., and rabbetted to receive 3/4

in. x 8 in. plates, bolsters bolted together with 3/4 in. bolts. The truck truss rod saddles are wrought iron 1 in. x 5 in., placed in center of bolster on white oak bolster truss rod block 1 1/2 in. x 5 in. x 15 in., are secured to bolster by two 1/2 in. x 5 in. lag screws. The brake lever guides are made of 3/4 in. round iron, with one end projecting 3 in. into bolster and the other end secured by one 3/4 in. bolt which takes fulcrum bracket on the other side of bolster with single nut and cotter; the

3/4 in. bolts in each piece, having double nuts and cotters. The lower part of safety yokes is made of 3/4 in. x 2 in. iron, secured to the upper piece of yoke with 1/2 in. bolts which have double nuts and cotters.

The truck is equipped with metal brakebeams; the fulcrum bar to pass over top of spring plank. Also equipped with Master Car Builders' standard Christie shoe. Shoes and heads are to be spaced 5 ft. centers; shoes to be secured to heads by wrought iron key, made



60,000-lb. Freight Car Truck, "No. 4 B"—Baltimore & Ohio Railroad.

other end of fulcrum bracket to be also secured by a 3/4 in. bolt with single nut and cotter.

The spring plank is a channel bar, 12 in. wide, 1 1/2 in. thick and 2 3/4 in. flange. The spring seat is of cast iron, fits into the channel, and is fastened with two 3/4 in. bolts, having double nuts and key below pedestal tie bar. The bolster guide bars are secured between the arch bars with 1 1/2 in. bolts, having double nuts and key below the tie bar. Guide bars are also fastened to channel spring plank with 3/4 in. bolts; the inside bolts are single nutted with cotter pins outside of nuts, and the outside bolts have double nuts with flat key outside of nuts. Brake beam safety yokes are spaced 2 ft. 5 in. from center to center; the upper piece is of 1/2 in. x 2 in. iron, which is shaped to fit the channel, and secured thereto with two

in circling and tapering shape; lower edge of lever and fulcrum bar to be secured to brakebeam by 1 1/2 in. turned pins. Brake hangers are to be 3/4 in. round, shaped and secured to wing of bolster guide bar with 3/4 in. key bolt.

The top arch bars are 1 1/2 in. x 4 in., and inverted arch bars are 1 in. x 4 in.; pedestal tie bars are 3/4 in. x 4 in., all of best quality of wrought iron, and drilled punching will not be allowed.

The dust-guards are yellow poplar or bass wood being Stier pattern, and placed in journal boxes with felt next to journal. The journal bearings are lined with soft metal, the weight not less than 12 lbs. each. The journal boxes have cast-iron journal bearing keys and journal bearings, pressed steel or malleable iron lids, the lids to be secured with 3/4 in. turned pins, passing

through a $\frac{1}{2}$ -in. hole in the lug of journal box, which must be placed in the lug so as to have the lids fit the boxes neatly.

The brake levers are 1 in. \times $3\frac{3}{4}$ in., and connected with each other by brake lever fulcrum made of $1\frac{1}{2}$ -in. round iron, having ends made of $\frac{3}{4}$ -in. \times $2\frac{1}{2}$ -in. iron.

A Track Brake.

A committee of the Southern and Southwestern Railway Club was appointed to investigate a track brake, known as the Devlin brake. The committee consisted of Mr. R. M. Galbraith, General Master Mechanic St. Louis Southwestern; Mr. R. H. Briggs, Master Mechanic Kansas City, Memphis & Birmingham, and Mr. M. T. Carson, Superintendent Machinery Mobile & Ohio. The report of the committee follows:

The committee met in Memphis, April 1, Mr. Galbraith and Mr. Briggs, of the committee, being present; Mr. Carson being unable to attend, the committee requested Mr. J. J. O'Rourke, Master Mechanic of the Illinois Central Railroad, to act in his stead.

Mr. Devlin had a refrigerator car weighing 35,200 lbs. equipped with his brake on both trucks, and the Iron Mountain Railway furnished an engine to make the test.

The common brakeshoe is applied upon the wheel with an additional shoe 7 in. long attached to same head for rail friction. This head is attached to the standard brake beam which in turn is hung to an eye bolt hanger, passing up through a horizontal bar of $3 \times \frac{1}{2}$ in. iron, which is fastened to the extreme outward ends of the arch bars by the arch bars being extended to a point about 4 in. in front of the wheel.

The eye bolt heretofore mentioned passes through the horizontal bar in front of the wheels and extends to a point about 10 in. above the horizontal bar, and coil spring is placed around this hanger, being about $1\frac{1}{2}$ in. in diameter, on which is placed a large washer secured by a nut. The rotary motion of the wheel carries the brakebeam down by compressing the spring until the rail shoe comes in contact with the rail, forming a friction upon the same. The rear beam on each truck has the same effect as the common brake, while the front beam of each truck forms the rail friction brake in addition to the common brake. The invention shows ingenuity on the part of the inventor, as it is well planned and shows considerable study on his part.

The first thing taken into consideration by your committee was the braking power exerted by the foundation brake, which was shown to be about 66 per cent. of the light weight of the car.

The committee then proceeded to make runs and tests on a straight track by first placing two flags 45 ft. apart, the first as a signal to shut off steam and the second a signal to apply the emergency brake, the engine to approach the first flag at a speed of 20 miles per hour. Two runs were made with the brake as used ordinarily with the springs blocked up so the rail shoes could not reach the rail and all brakeshoes bearing on the wheels only. The first two runs the stops were made in a distance of 342 ft.; the last half of the distance, all wheels were sliding and left burnt iron from the wheels sticking to the rails. We then arranged to try the Devlin brake with the same runs and under the same conditions. The wheels stopped revolving at about the same place, all friction being taken by the rail shoes. The stops averaged about 23 per cent. less distance than with the common brake. We examined the wheels and found that they were not marked by the sliding on the rail, showing that they were slightly raised when they stopped revolving. We noticed no bad effects on the rails from the sliding of the rail shoes. The car was then taken on a curve of 20 deg. which was quite sharp. The brakes were applied and the engine pulled the car around the curve with wheels sliding, all friction being taken up by the rail shoes. After stopping we examined the wheels and found the flanges showed evidences of heavy pressure, caused by sliding and guiding the car around the curve. The car was then backed around the curves with the brakes set and engine working steam. There was a badly worn frog in the connecting track on the outside of the curve, and when the rail shoes reached this frog they fell into the throat of the same, bending the head in such a manner that the shoes were clear of the rail. This ended our investigation. While the rail shoes were not made properly, being shaped in front like a sad-iron, while it should have been square and shaped in front like a toboggan, the committee are of the opinion that it will make a valuable improvement on street cars in the saving of slid flat wheels and acting as a guard to keep persons who may fall on the track from being mangled by the wheels, and that there are so many conditions to be overcome in steam railway practice that we could not recommend the device for general railroad use in its present state.

St. Louis Meeting of the American Society of Mechanical Engineers.

Although from a point of numbers in attendance at this meeting it was not satisfactory, the results in every other respect were highly gratifying. Good papers, ample discussion, profuse entertainment and almost perfect weather throughout, made the meeting a very successful one.

The Eastern contingent of about one carful left New York at 2 p. m., May 18, via the Pennsylvania Railroad, and reached St. Louis on time, as the heavy rains had not interfered with traffic on this road, as was the case on the others running to the same point.

Those who had arrived previously and from nearby points were escorted around town visiting the many manufactories during Tuesday afternoon. In the evening there was an informal reception at the Southern Hotel parlors, when Col. E. D. Meier made a short address of welcome, in which he dwelt upon the antiquity of the city and its importance as a manufacturing center. He emphasized with pride the fact that Capt. J. B. Eads had there constructed a fleet of ironclads in 1861, which was the precursor of others, and made him famous, even before he had planned his famous chrome steel arch bridge, which is still an engineering monument.

Mr. JOHN FRITZ, President of the Society, answered in a few well-chosen remarks, after which refreshments

were served and an enjoyable hour was spent in conversation.

On Wednesday morning the meeting was called to order at 10 by President John Fritz. The teller's report, showing the election of 65 new members, was first presented, increasing the total membership to about 1,800.

The Committees on Standard Test, Specimens and Methods of Testing Materials, and on Revision of Code for Steam Boiler Trials reported progress. The former promised a final report on cast iron in December.

The first paper was by Mr. William J. Keep on "Strength of Cast Iron." This paper gives a résumé of the tests made for the above-named committee and contains some valuable practical methods for determining shrinkage and strength of cast iron, knowing the Si or the strength of any one size of test bar. It had been shown in previous papers that the Si determines the shrinkage and that this end the size of bar control the strength. The previous proof of insufficiency of the 1-in. sq. bar for studying the strength of cast iron led to the conclusion that a different size should be adopted, but as neither a larger nor a smaller bar gave sufficient information the author suggested the use of both, viz., a larger and a smaller. The results of tests of these were then shown to lie on a hyperbola on which at proper points would also be found the strength of any other size bar. Then forming hyperbolae for each grade (Si per cent.) of cast iron as indicated by the shrinkage, these curves would readily answer for the determination of physical qualities of any size casting.

Professor BENJAMIN discussed the paper, showing that the common formulae for strength did not at all hold good, as these were not based on conditions depending upon size of bars, but entirely on complete uniformity of qualities, regardless of cooling rate and other important factors. He then adduced an empirical formula, based on the tests given in the paper, which made allowance for decrease of strength according to increase of size.

The next paper taken up was by Mr. Wm. Kent on "The Efficiency of a Steam Boiler. What is it?" The author discussed the advisability of using either the pound of "coal" or pound of "combustible" for determining the efficiency of boilers. He quotes opinions from Col. E. D. Meier, W. H. Bryan, Capt. Robt. W. Hunt, Prof. W. D. Potter, F. W. Dean and Dr. C. E. Emery as to which should be the basis for calculating efficiency. He then proceeds to show that neither chemical analyses nor calorimeters can be relied upon, according to his idea, to determine the heat units in a pound of coal, and efficiency being based on this, and all may be faulty, he asks: "Can any one of them properly be called the efficiency of the boiler, and if so, which one?" And, after going through a series of calculations based on a few cases claims "that they demonstrate the total unreliability of the 'efficiency' as at present determined."

Mr. G. H. BARRUS opened the discussion of this paper by making a request that it be not discussed, because it was one of the subjects now before the special committee on boiler trials, which had discussed it without reaching a conclusion. Nevertheless, a lively discussion ensued, in which every point in the paper was attacked.

Col. E. D. MEIER called attention to the fact that boiler tests were totally different in the E. & W., as firing was different, in that W coal required constant attention and trimming, while E coal was to be let alone. He claimed that for this reason coal should be used as standard for efficiency, because, as all material found below grate was deducted as "ash," the amount of combustible might be reduced at will by a "skillful" fireman.

W. H. BRYAN endorses this position and advises the use of Thompson calorimeters and states that $E = 60$ per cent. in tubular and 70 per cent. in water tube boilers should be obtained with Western coal. He pointed out that calorimeters can only be used by careful men, the same as most scientific instruments and that the same experiments can readily duplicate results.

C. I. ROCKWOOD suggested that there were two phases of testing boilers, viz., commercial and scientific, and that while the ordinary guarantee of pounds water evaporated per pound coal was sufficient for the former, the efficiency was determined by the other; in the latter, ample care should be exercised in the use of instruments and chemistry to ensure accurate results when the difficulties mentioned would disappear.

A. A. CAREY said that calorimetric value coal depends upon investigator and by experience he has found which to call upon for low and calorimetric values of coal or high efficiencies and which to avoid as giving high values and hence low efficiency.

PROF. PORTER upheld the pound of coal and ridiculed the pound of combustible and said that calorimeters are correct in the hands of careful experimenters.

BARNET LE VAN condemned the so-called "Centennial" standard for rating of boilers.

PROF. J. H. KINEALY stated that calorimeter determinations depend upon whether the necessary oxygen is obtained from chlorates or from nitrates, as the same coal will give different values as the one or the other is used. His own experience had shown this to be a fact.

J. B. BLOOD considered that evaporation of so many pounds water for a given quantity of coal used under actual operating conditions should be used as standard of efficiency.

The following paper was by Mr. A. H. Eldridge on "Tests of a Four-Cylinder Triple Expansion Engine and Boiler."

This paper gives some tests on the experimental engine at Sibley College. The discussion showed that it was very faulty, and that the engine is very faulty; the B. T. U. per I. H. P. should have been 500 instead of 314, which would reduce efficiency from 90 per cent. to 70 per cent.

H. H. TUPPLEE stated that leakage should have been determined as of great importance.

J. A. LAIRD called attention to the fact that no pains had been taken to determine the accuracy of water meter, which was useless for the purpose, he thought; that while a small error would make no difference in a factory, a few gallons not accounted for in an engine test would to some people appear fatal.

During the afternoon of Wednesday the members and many guests were "trolleyed" through the city to Forest Park, where, carriages being in waiting, the entire party made a tour of the park and some of the adjoining residence districts. Of course lemonade and the usual engineer's thirst satisfiers were provided, and the return trip was made over newly laid electric roads which were remarkable for their smooth running.

The next paper taken up was by Mr. R. S. Hale, on "Determining Moisture in Coal."

This paper contains a very complete reference as to the chemical analysis and determination of water in coal.

W. H. BRYAN suggested that all that was necessary was to determine the "accidental" admixture of water, as all coal naturally contained some, and hence this should not be removed as changing character of coal.

Prof. J. H. KINEALY thought that all samples should be dried in laboratory to positively remove all water in order to obtain fair sample, although the paper stated, and others had pointed out that Western soft coals lose volatile matter under the action of moderate temperatures.

WM. KENT arose to suggest an apparatus for drying coal samples by steam; he proposed to steam-jacket a closed drum, in which the finely-divided coal was placed, heated to 212 deg. Fahr., and the moisture then to be driven off through a central tube open to the air. He then explained that he considered this a very good suggestion, but stated that if any one had an opinion on the subject he would be glad to hear of it. Hereupon,

G. C. HENNING arose to state that he had an opinion and stated that he thought the suggestion was of little value, and for two reasons: Firstly, that 212 deg. would drive off volatile matter; secondly, might ignite sulphurous coal, and, thirdly, that the amount of water driven off would depend upon hygroscopic conditions of external air. He then suggested an amendment to do away with the steam-jacket and merely to blow air previously dried by passing it over calcium, through the finely-divided coal, until all moisture had been absorbed.

MESSRS. CARY, TUPPLEE and NASON agreed with this and the latter stated that any water driven off by steam would have to be condensed.

The first paper presented Wednesday Evening, was by Mr. Chas. W. Kettell, on "A Study of the Proper Method of Determining the Strength of Pump Cylinders."

This was discussed by Prof. E. C. Benjamin, who pointed out that little reliance could be placed on present formulae for strength of best iron cylinders; that cracks appeared where flanges join the cylinder and that tension of cylinder head bolts should be added to internal strains.

This was followed by Prof. W. F. M. Goss, on "The Effect upon Diagrams of Long Pipe Connections for Steam Engine Indicators."

This paper was one of the best presented and its conclusions, with a few indicator diagrams, show its practical value.

Conclusions.

1. If an indicator is to be relied upon to give a true record of the varying pressures and volumes within an engine cylinder, its connection therewith must be direct and very short.

2. Any pipe connection between an indicator and an engine cylinder is likely to affect the action of the indicator; under ordinary conditions of speed and pressure, a very short length of pipe may produce a measurable effect in the diagram, and a length of 3 ft. or more may be sufficient to render the cards valueless except for rough or approximate work.

3. In general, the effect of the pipe is to retard the pencil action of the indicator attached to it.

4. Other conditions being equal, the effects produced by a pipe between an indicator and an engine cylinder become more pronounced as the speed of the engine is increased.

5. Modifications in the form of the diagram, resulting from the presence of a pipe, are proportionally greater for short cut-off cards than for those of longer cut-off, other things being equal.

6. Even's of the stroke (cut-off, release, beginning of compression) are recorded by an indicator attached to a pipe, later than the actual occurrence of the events in the cylinder.

7. As recorded by an indicator attached to a pipe, pressures during the greater part of expansion are higher, and during compression are lower, than the actual pressures existing in the cylinder.

8. The area of diagrams made by an indicator attached to a pipe may be greater or less than the area of the true card, depending upon the length of the pipe; for lengths such as are ordinarily used, the area of the pipe-cards will be greater than that of the true cards.

9. Within limits, the indicated power of the engine is increased by increasing the length of the indicator pipe.

10. Conclusions concerning the character of the expansion or compression curves, or concerning changes in the quality of the mixture in the cylinder during expansion or compression, are unreliable when based upon cards obtained from indicators attached to the cylinder through the medium of a pipe, even though the pipe is short.

The next paper was by R. C. Carpenter, on "A New Form of Steam Calorimeter." This will be given later. This was followed by a paper by Mr. J. D. Hoffman on "A Hydraulic Dynamometer." The paper describes the instruments, and gives interesting results obtained therewith. The author examines its possible errors but finds it to be practically correct. Prof. F. W. M. Goss testified to the uniformly good results obtained with it and considers it a practical and convenient form of instrument for measuring and recording loads transmitted especially for cutting tools.

During Wednesday evening a large screen and lantern had been set up in the meeting parlor and used by H. F. J. Porter, who spoke on "Hollow Steel Forgings." Instead of reading the paper a great number of fine pictures were thrown on the screen showing how hollow forgings were made at the Bethlehem Iron Works, the author explaining each slide as shown.

On Thursday morning the following papers were presented: Geo. R. Henderson, "Spring Tables"; Jay M. Whitham, "Effect of Retarders in Fire Tubes of Steam Boilers"; Jay M. Whitham, "Experiments with Me-

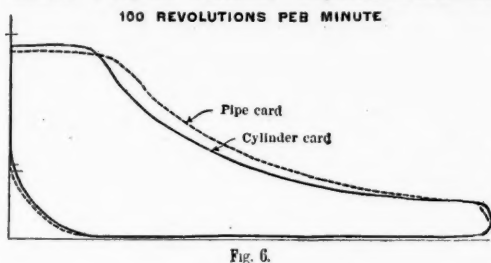


Fig. 6.

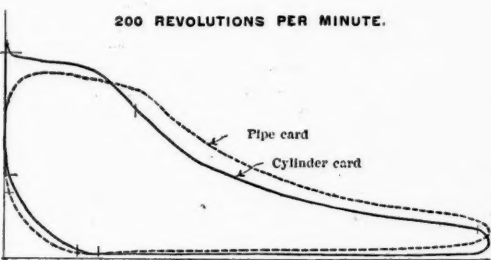


Fig. 7.

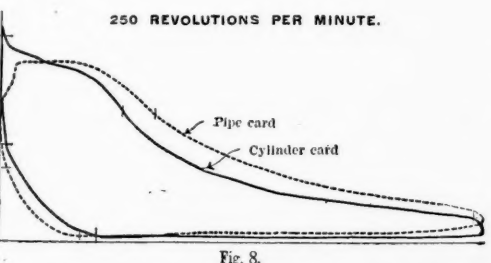


Fig. 8.

NOTE.—The steam pressure (80 lbs.) the length of pipe (10 ft.) and the cut-off (approximately $\frac{1}{4}$ stroke), were constant for all diagrams on this page.

chanical Stokers"; R. H. Thurston, "Superheated Steam"; Wm. H. Bryan, "Western River Steamers." A brief abstract of Mr. Whitman's paper on "Retarders" follows:

The trials were conducted on a 100-H. P. horizontal tubular boiler at the Sutherland Avenue Station of the Philadelphia Traction Company, Philadelphia. The purpose of the trials was to ascertain under what conditions, if any, retarders in the fire tubes would add to the efficiency of the boiler.

It is evident that retarders enable a boiler to be run as economically on 5 sq. ft. of heating surface to the horsepower as on 21.7 sq. ft., or, practically, as on any number of square feet between these limits.

Conclusions.

1. Retarders in fire tubes of a boiler interpose a resistance varying with the rate of combustion, shown in Fig. 2.
2. Retarders result in reducing the temperature of the waste gases, and in increasing the effectiveness of the heating surface of the tubes.
3. Retarders show an economic advantage when the boiler is pushed, varying in the tests from three to eighteen per cent.
4. Retarders should not be used when boilers are run very gently, and when the stack draft is small.
5. It is probable that retarders can be used with advantage in plants using a fan or steam blast under the fire, or a strong natural or induced chimney draft, when burning either anthracite or bituminous coals.
6. Retarders may often prove to be as economical as are economizers, and will not, in general, interpose as much resistance to the draft.
7. Retarders can be used only with fire tubular boilers.
8. The economic results obtained on the boiler tested are ideal, showing that it was clean, the coal good in quality, and the firing skillful.
9. With retarders the tubes are more effectively cleaned than without their use.
10. The tests prove that the marine practice of using retarders is good, and that the claim, often advanced, that they show from five to ten per cent. advantage, holds, whenever the boiler plant is pushed and the draft is strong.

Mr. C. W. BAKER in the discussion, said that this was the first extended account of their use and their advantages which has appeared in technical literature, although, of course, allusions to their use in connection with various steam plants have been made in various papers.

Another curious fact is that the action of "retarders" in the flue has been generally misunderstood, as is indicated by their name. The retarder does, of course, ob-

struct and "retard" the flow of gas through the flue, but this is by no means the purpose for which it is placed there. If it were desired simply to make the hot gases flow more slowly through the tubes, the simplest and best way is to check the draft by dampers in the chimney or at the ash-pit.

What the so-called retarder does that is beneficial is to increase the amount of heat transmitted to the tube surface from the hot gases, and it does it in two ways; first, by a mixing action upon the gas in the tube. The friction upon the surface of the retarder aids in stirring up the gas in its passage through the tube, and in mixing the hot gas at the center with the cold film next the surface of the tube. Also, in every horizontal tube there is a tendency for the gases to be cooler in the upper part of the tube and hotter in the lower, for the upper half of the tube extracts heat far more readily from the tube than the lower half. The twist of the retarder has the effect of repeatedly turning over the gas in the tube as it flows along.

In the second place, the retarder acts by direct radiation of heat to the tube surface.

1. That the percentage of increase in heat transmitted due to radiation increases with increase in temperature of the gases passing through the tube.

2. That the percentage of increase in heat transmitted due to radiation is larger in vertical tubes than in horizontal, on account of the fact that a given area of heating surface in a horizontal tube absorbs heat faster by direct contact with the gases than the same area in a vertical tube.

An abstract follows of Mr. J. M. Whitman's paper on MECHANICAL STOKERS.

The advantages of mechanical stoking are: Adaptability to the burning of the cheapest grades of fuel; 40 per cent. labor saving in plants of 500 or more horsepower when provided with coal-handling machinery; economy in combustion, even under forced firing, with proper management; constancy and uniformity of furnace conditions, and smokelessness. The disadvantages are: High first cost, varying from \$25 to \$40 per square foot of grate area; high cost of repairs per annum; the dependence of the power plant upon the stoker engine's workings; steam cost of running the stoker engine; cost of steam used for a steam blast, or for driving a fan blast, whenever either is used, which, for a steam blast, is from 5 to 11 per cent. of the steam generated by the boilers and from 3 to 5 per cent. for a fan blast, and skill is required in operating the stoker. This abstract of the paper is principally to give results of trials of the Wilkinson, Coxe, and Babcock & Wilcox stokers.

The Wilkinson Stoker.—This stoker consists of hollow bars, set at an angle of about 25 deg. with the horizontal, with open ends. The top of the bars is stepped and tapers-shaped openings, about $\frac{1}{4} \times 3$ in., are provided in each riser. The bars are carried, at their ends, on hollow boxes and are 4-in. centers. The feeding is accomplished by the motion of the grates, no feed roll or pusher being required.

Some Results Obtained with the Wilkinson Stoker.—1. Small grades of anthracite coal pack closely upon the grate and offer much resistance to the introduction of the air supply, requiring a strong blast.

2. The efficiency of the steam blast is less than that of the other forms of steam blowers noticed in this paper, yet for a given combustion rate no more steam is used.

The Coxe Stoker.—This consists of a travelling chain grate with a fire on its upper surface. The coal is fed by the motion of the grate at the front. There are four blast compartments under the fire, connected by dampers or registers, so that the intensity of the fan blast may be varied in each compartment.

Summary Regarding the Coxe Stoker.—1. The stoker engine and fan blast use about 4 per cent. of the steam generated in the boilers.

2. The fires resembled a puddling furnace. Analyses of the flue gases proved that the combustion was good.

3. A most annoying and peculiar deposit of ash, etc., rapidly collected against the water tubes, due to the intensity of the blast in the two central compartments.

4. The stoker will quickly respond to sudden fluctuations in power demands.

5. The economic results obtained on the trials were good.

6. Crowding the fires produces but little reduction in the economy.

7. About three-fourths as much capacity can be developed with rice as with buckwheat coal under like conditions.

8. More than ordinary care and skill is required in operating this stoker on account of the graduated air blast used.

The Babcock & Wilcox Stoker.—Like the Coxe, this stoker is of the chain-grate type. It is useful only for burning bituminous coal. It differs from the Coxe in many constructive features. The Babcock & Wilcox stoker had an active grate 78 in. wide by 84 in. long, with 21 per cent. air openings for the boilers. The ratio of heating to grate surface was 60.6. The speed of the grate varied from 2 in. to $2\frac{1}{2}$ in. per minute, and only natural draft was employed.

Part Summary Regarding the Babcock & Wilcox Stoker.—1. This stoker is smokeless when run as in the tests. It did not form a clinker, nor require the use of a firing tool.

2. It readily responds to fluctuating boiler demands, where the stack draft is good.

3. It requires a strong draft, either natural, induced or forced.

4. The boiler develops almost ideal economy when forced to develop an evaporative horsepower on six square feet of heating surface, which is never realized with hand firing.

5. No charge can be made against this stoker for steam used, other than from one-fifth to two-fifths of one per cent. for driving the stoker engine.

General Summary.

1. Each stoker gives ideal economic results when properly handled.

2. Stoker engines use from one-fifth to two-fifths of one per cent. of the steam generated.

3. Fan blasts use from three to five per cent. of the steam generated.

4. Steam blasts use from five to eleven per cent. of the steam generated.

5. A defect common to each of the stokers named in this paper is a too scanty air space in the grate.

6. Neither stoker will develop as much capacity as will hand firing with stationary grates having the same draft and coal conditions. Stokers, however, are not only more constant in the power developed than is a hand-fired grate, but are more responsive to fluctuations in the power demands. The stoker is always in the condition that a hand-worked fire

is in just after its cleaning, i. e., always clean and "ready for a pull."

Mr. W. H. BRYAN corroborated this by saying that stokers would not answer for low-grade and dirty coals as method of firing was very variable, depending upon the fuel.

Mr. W. H. Bryan's paper on "River Steamers" was in answer to some remarks in the Presidential address of Geo. S. Morison, of the A. S. C. E. in 1895, and assumed that the adverse criticism arose from a lack of understanding of the requirements of the case. It was pointed out that repeated trials had demonstrated that the present form of Western river steam was the only efficient one under existing conditions, being the survival of the fittest.

Professor Thurston's paper on "Superheated Steam," being only a review of the work of others, was not discussed.

On Friday morning the following papers were read and discussed: Mr. L. R. Alberger, "A Self-Cooling Condenser"; Prof. F. R. Hutton, "A Classification and Catalogue System for an Engineering Library," and Mr. Thos. E. Murray, "A Steel Plate Flywheel." The first gave an account of a practical device for condensing steam and cooling the water and results of experience with same. The author put into a mechanical form what is used in such a crude manner in most salt works, viz., the Brush evaporator. By adding a fan and determining its best proportions, a superior apparatus, serviceable at all times and in any place, has been developed, which will come into universal use.

Dr. C. E. EMERY in his discussion pointed out the practical utility of the device and endorsed it most heartily. Prof. F. W. M. Goss inquired whether oil would clog the interior, and was informed that some of course seemed to settle internally but that it did not seem to accumulate; still an oil separator should be used.

The second paper caused some discussion, which was of little importance, but H. H. Supplee called attention to the fact that the Franklin Institute Library catalogue was based on the plan suggested by the author and was very satisfactory.

Consideration of the last paper can be omitted.

On Friday afternoon a visit was paid to the Anheuser-Busch Brewery, and after examining all of the mechanical processes and the beauty and luxury of the place, the visitors were invited to examine the mysteries of the Hotel "Sternenwirth," so called because the accounts are there written in the stars.

Kindling Locomotive Fires.

At the April meeting of the Southern & Southwestern Railway Club a communication was read from Mr. R. P. C. Sanderson, Division Superintendent of Motive Power, Norfolk & Western, on the Present State of the Art of Kindling Locomotive Fires with Oil. That communication follows, with an abstract of the discussion:

Mr. Sanderson wrote: It is only recently that much has been heard about kindling fires of locomotives by the use of oils instead of cord wood or waste wood from the car shops, and much mystery and many patents have been in evidence since then.

To ascertain just exactly how much economy was to be achieved by discarding wood for kindling fires and introducing the use of oil, experimental apparatuses of different kinds were prepared at some of the shops of the Norfolk & Western Railroad, and after a few months of experimental use, with varying success, it was found that the economy by the use of oil as compared with firewood was so great that pressure was then brought to bear on each of the shops to see how little oil could be used for this purpose.

In the first devices experimented with, crude or fuel oil was employed, as it was thought that the greater calorific properties of crude were decidedly beneficial. As it was a great inconvenience to carry the small quantities of this special oil in stock at points where cheap black oil used for lubricating cars was carried in storage tanks, the use of crude oil was soon abandoned and lubricating oil used, with a small addition of kerosene to make it more inflammable. Subsequently it was found that the addition of kerosene was quite unnecessary and that the lubricating oil was sufficient in itself.

It was then found that by establishing some rivalry between the different shops the quantity of oil used could be steadily reduced until the cost per engine for a month's firing up had dropped to one and one-fifth cents per engine. Subsequently to this it was further found, by one of our master mechanics, that the oil was entirely unnecessary, and that by heaping up lump coal in a mound a short distance from the inside of the fire door and by throwing the usual handful of greasy waste (discarded by the wipers) on the face of this coal pile, setting fire to this waste, and then directing a jet of compressed air directly on this small bunch of burning waste, the flame from it can be driven right into the coal pile, and that in the course of four or five minutes, or possibly a little longer according to the condition of the coal and the pressure of the air used, the mound or heap of coal can be brought to a good red heat ready for spreading over the grate bars without the use of any oil whatever. This plan has been found to be successful with the Pocahontas coal, Clinch Valley coals, and Thacker and semi-splint coals used on the Norfolk & Western Railroad, which vary somewhat widely in their nature; and it is believed that this same plan can be followed with any coal that is not too hard or slow burning in its composition.

I do not wish to say that we do not now use any oil for firing up, because we have found that with the use of a little oil in with the compressed air, it will hurry up matters a little in cases of emergency.

The majority of the engines fired, which are referred to, have large fire boxes ten feet or more in length, and at most of the engine houses the boilers are filled with hot water, and in this way considerable economy in time in firing up and getting engines ready for service has been accomplished without any injury to the boilers.

Where nothing but air is used to ignite the coal, it will be found ordinarily that it does not pay to handle the scrap wood from the car repair tracks or the old ties or bridge lumber, as the cost of cutting it up and handling

it is greater than the small amount of coal consumed in compressing the air, and to get rid of this old material it is found to be more economical to sell it as firewood to the employees and public at a small price, or to burn it up in heaps where it lies, if it cannot be got rid of in any other way.

Mr. HUDSON: I find that fires can be kindled with a great deal of economy without using any oil at all, by simply putting in a small quantity of waste, and using the steam blower on the engine. We fire here about as many engines without oil as with oil, and there is no injury to the flues or sheets. There is practically no difference; the time is about the same either with or without oil.

Mr. WM. ANDERSON: So far as my experience goes, I remember making one experiment in kindling fires with dirty waste, with greasy waste from wiping. It took within a few pounds of 500 lbs. of coal to get 65 or 70 lbs. of steam. I did not use any wood, just used the steam blower connected to the pipe of the ordinary blower to kindle with, and we got steam up in about 55 minutes. I have not used any wood for over two years; we kindle all our fires with waste that has been used to wipe with.

TECHNICAL.

Manufacturing and Business.

The business of the Berry & Orton Company, the Philadelphia wood-working machine manufacturers, has been taken over by a new corporation entitled the Atlantic Works. L. H. Berry is President of the new corporation, and will be in charge of the manufacturing department; the Treasurer is Lawrence Power, who has long been identified with wood-working machinery in Philadelphia, and will be in charge of the financial management of the new company. John Eagan is Vice-President and H. W. Thorne is Secretary. The factory, at Twenty-third and Arch streets, Philadelphia, is a comparatively new building, having been erected in 1891 by Berry & Orton, and is completely equipped. It is a stone and brick structure, 123 ft. x 140 ft. and five stories in height, with good railroad connections. The reorganization gives the company increased capital, and puts it in position to do a large business.

The orders of the power and mining department of the General Electric Co. during two weeks of last month included motors to operate printing presses, saws and planers in a box factory, an assortment of mining machinery in a coal mine, machinery in a large bakery, blowers in a stove works, a Gould fire pump, a mine pump, large Brush arc lighting dynamos, a jib crane, traveling cranes, machinery in an oilcloth works and inclined railroad, a record which shows the wide diversity of uses to which electric motors are now being put.

The Niles Tool Works, Hamilton, O., have shipped a 16-ft. boring machine to the York (Pa.) Manufacturing Co.

The Cleveland Twist Drill Co. has been awarded the Edward Longstress medal of merit by the Franklin Institute of Philadelphia for the Cleveland grip socket, a device for holding and driving taper shank twist drills, which is in inextensive use.

The Trojan Coupler Company has received an order through its Western agent for couplers for a large number of cars for the Louisville, New Albany & Chicago and it is announced that that company will equip all its freight cars not now equipped with automatic couplers with this type of coupler.

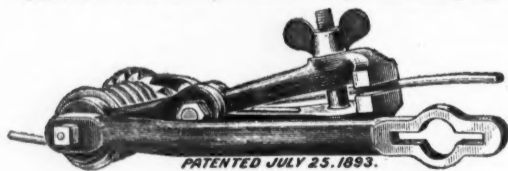
New Stations and Shops.

The Ohio River road has prepared plans and secured ground for a new roundhouse, and repair shops at Wheeling, W. Va.

Iron and Steel.

The Cambria Iron & Steel Co. is making an extension to its mills, which will enable it to roll I beams up to and including 24 inches.

The Doherty Patent Combined Vise and Winch.
The Doherty combined vise and winch, which is shown in the accompanying cut, has a number of improvements over the old strap and vise or block and fall device used at present in telegraph, telephone and trolley wiring, electric light line work, in tightening guy wires, in putting up suspension wires for cables, pulling up wires and in cutting out slack. In fact it can be used for stringing wires of every description upon poles or fixtures of any kind and in tightening all gauges



The Doherty Combined Vise and Winch.

of wire to any advisable degree of tension. It is available for use in making repairs to live wires without the necessity of using the usual cut-outs, thus preserving the lineman from the danger of the cut-out falling off. The tool itself being entirely of metal completes the circuit. With this winch one man can pull up two miles of wire at one time easier, quicker and more effectively than the usual gang of four men can pull up two ordinary sections with the strap and vise or block and fall in use at present. As an indication of its power, it is only necessary to state that it can pull apart a No. 8 iron wire in an ordinary section. The tool, which

weighs only 6 lbs., is manufactured solely by Messrs. Brown, Jaeger & Co., 919 Betz Building, Philadelphia.

Gold's Electric Heater.

We explained briefly in our issue of May 8, (page 328) the arrangements of coils in the heater made by the Gold Car Heating Co. of New York, which has given the subject of car-heating apparatus special attention and should be competent to meet the demands for a reliable electric heater. The sectional view which we present will give a better idea of this arrangement. The coils



shown in the cut are an inch and a quarter in diameter and made of a composition which is held as a secret by the company. They are held securely by slight grooves in asbestos boards, in such a manner that no strain is put upon the wires of the resistance coils by contraction or expansion. Three gradations of heat are obtained by turning a handle to points 1, 2 and 3, noted on the dial. The heater, at present, is being exhibited at the Electrical Exposition in New York.

Ruberoid Car Roofing.

Ruberoid roofing, an insulating sheathing material, is becoming largely used for roofs where some non-conductor is required. It is manufactured in different weights, the lighter grades of which are especially adapted for car roofs, while the heavier ones are used on roundhouses, train sheds or any roof subject to the action of locomotive fumes and gases. The grades intended for car roofs are not made from the usual paper base, which will become torn and broken from the racking of the car, but from cow hair felt, making it very strong and pliable. The base is saturated with P. & B. water and acid proof composition, making it a non-conductor, and it is not affected by changes of temperature. It is absolutely free from tar or any deteriorating elements, and is guaranteed to last for 10 years. Ruberoid is also used for laying between floors of refrigerator cars for which, owing to its elastic and waterproof nature, it is admirably adapted. It is put up in rolls containing sufficient material to cover a car roof; it is without odor and is easy and clean to handle, as it does not require pitch or paint at the seams. As mentioned before, it is made in heavier weights for buildings, and it can be made almost any width at short notice. This roofing is being manufactured by the Standard Paint Company, 81 John street, New York.

The Diamond Shoal Light.

The question of a light on the Diamond Shoal, off Hatteras, appears to be settled for the present. Congress has authorized an expenditure of \$90,000 for a lightship. This disposes of the effort which has been made through a number of years to build a lighthouse at that extremely dangerous and difficult point. Contracts for the lightship will be put under way at once, and it is believed that the ship will be in position within a year.

Officers of the American Institute of Electrical Engineers.

At the annual meeting of the American Institute of Electrical Engineers, held May 20, at the Grand Central Palace, the following officers were elected: President, Dr. Louis Duncan, of Baltimore; Vice-Presidents, Charles P. Steinmetz, of Schenectady; Harris J. Ryan, Wilbur M. Stine; Managers, John W. Lieb, Jr., F. A. Pickernell, William L. Puffer, L. B. Stillwell; Secretary, Ralph W. Pope; Treasurer, George A. Hamilton.

The Brooklyn Bridge Power House.

The Babcock & Wilson Boiler Co. was last week awarded the contract for furnishing two boilers of 400 H. P. at a cost of \$4,350 for the electric power house of the New York & Brooklyn Bridge. The Walker Manufacturing Company was awarded the contract for two generators at \$15,849, and the Southworth Foundry & Machine Co. a contract for two 600 H. P. engines at \$16,400.

Woodline for Preserving Oak Bridge Timbers.

The American Wood Preserving Co., of Philadelphia, manufacturers of "woodline," have just received an order for 2,600 gallons from the Pennsylvania to be used in treating large white oak bridge timbers and several thousand mixed oak crossties at Pavonia, N. J. By use of a specially designed system of trucks and hoisting derrick, used in conjunction with the tank, ties to the number of 1,440 a day can be impregnated. This reduces the cost of applying "woodline" to crossties in large quantities to a minimum.

The Gould-Trojan Coupler Suit.

The suit of the Gould Coupler Company for preliminary injunction against the Trojan Car Coupler Company, which was recently decided by Judge Cox, of the U. S. Circuit Court, Northern District of New York, in favor of the Gould Company, must still be fresh in the mind of the reader. From the decision of that court the Trojan Company appealed and on Wednesday morning of this week the decision of the United States Court of Appeals, Second Judicial District, was handed down. That decision reverses Judge Cox's decision and denies the injunction, with costs to the Gould Company.

THE SCRAP HEAP.

Notes.

The Erie road is now loading its freight trains on the tonnage basis. On the lines west of Salamanca a schedule showing the ratings of the engines has just been issued.

The Governor of New Jersey has appointed an "Equal Taxation Commission," which is to make a general investigation of the subject of taxation of railroad property, and report to the next Legislature.

The State Railroad Commissioners of New York last week ordered the Port Jervis, Monticello & N. w York road to limit the speed of all of its trains to 10 miles an hour, the Commissioners having decided that in several places the track is unsafe for any higher speed.

The Brooklyn Rapid Transit Company has now enlarged its free transfer privileges to such an extent that a passenger can ride from Bensonhurst to Jamaica, about 18 miles, for 5 cents. This is hailed by the newspapers as a great boon to the public; though whether anybody ever wants to ride that distance on a street car is not stated.

The people who racked their brains to find a name for the new Lehigh Valley train, with at best a chance of only \$25, might have made five dollars—or, at least, might have had that much better chance—by waiting for the offer of the South Jersey Railroad, which now wants a name for a train, which is to be run from Camden to Cape May, 79 miles, in 88 minutes. The successful bidder can have an annual pass over the road or \$30 in money.

The Brooklyn Heights (electric street) Railroad of Brooklyn, N. Y., which a year ago appropriated \$10,000 to be paid to conductors and motormen maintaining a clear record for one year, has this week distributed the money to 1,139 men. President Rossiter says that the results of the announcement that these rewards would be given have been beneficial and satisfactory. The men have taken a more intelligent interest in their work and the number of accidents has largely decreased.

The Union Pacific, Denver & Gulf will this summer run regular passenger trains daily over the South Park Division between Denver and Gunnison, Col., through the Alpine tunnel, 11,660 ft. above the level of the sea. This tunnel, 1,776 ft. long, completed in 1886, has gone unused since 1890, except that freight trains have run over the line during the last year, when the line was clear of snow. The financial troubles of the railroad company and the cost of operating the road through the mountains have been the main reasons why this line was not used. A few excursion trains were run through the tunnel last summer, and it is hoped that the tourist business will make regular daily trains profitable this year.

A suit to recover damages from a railroad company for being scared is one of the novelties recently reported in the English courts. Such suits by passengers, more or less disguised under claims of physical injury, are common enough, but this suit is by an employee. His name is Pugh, and he was a signalman on the London, Brighton & South Coast. About three years ago he saw two trains approaching in such a manner as to indicate that a collision would occur (although nothing serious did happen), and the incident caused such a shock to his nervous system that he has never recovered from it. The suit was on a policy of insurance issued by the railroad company. A jury awarded the plaintiff £43.

It is announced at Providence that the New York, New Haven & Hartford has made a contract with the Union (street) Railroad Company of that city to run electric cars over the Oakland Beach line, which is a 15-mile branch of the Stonington division of the New Haven road, leaving the main line near Auburn, about five miles south of Providence; and the reporters gather that the electric car company will manage the whole of the train service on the branch. This, however, would seem to be doubtful, as the branch trains run five miles over the main line, to and from the Union station in Providence. It is also reported by the newspapers that the New Haven company is experimenting on the Nantasket Beach electric line with a third rail for conveying power to cars, similar to that which was used on the Intramural road at the World's Fair, with a view to adopting something of the kind in place of the overhead trolley connection now used.

Efficiency of Car Replacers.

A derailed locomotive, weighing 136,000 lbs., on the New York, Ontario & Western Railroad was recently put on the track again with only its own power and crew by means of a pair of Alexander car replacers in eight minutes. These replacers were described and illustrated in our issue of Feb. 15, 1895. Mr. Geo. W. West, Superintendent of Motive Power on the N. Y., O. & W., says that formerly when a car or locomotive was derailed it was necessary to send out a wrecking train to put it on the track, but now this is done by the train or engine crew with a pair of replacers. These are made in various sizes, adapted for different heights of rails, those used for a 5-in. rail weighing only 100 lbs. per pair. The great convenience of having so simple and light an apparatus for putting rolling stock on the rails is evident. The replacers, which are guaranteed to carry 100 tons, are made by the Alexander Car Replacer Manufacturing Co., of Scranton, Pa.

Lake Notes.

One of the finest steam vessels of her class has just been put in commission by the Cleveland & Buffalo Transit Co., the City of Buffalo. The boat will be put on the route between the two cities at once. She will carry 550 berthed passengers, 600 tons of freight and 200 tons of coal. The vessel is 308 ft. long, 41 ft. beam, 17½ ft. deep, is propelled by compound engine of 52 and 80 in. diameter and 12-ft. stroke. The vessel cost \$375,000,

and was contracted for in May, 1895, work beginning in June, so that she has been under construction less than a year.

Since the opening of navigation, three weeks ago, there have been shipped from Duluth 9,500,000 bu. of grain, and there are in store now 13,000,000 bu. more. Considerable of this will go out at once. The shipments of flour have been light, the Eastern and European demand being usually small.

A Signal Suit.

The Union Switch & Signal Company has filed a bill in equity against the Atlantic City Railroad in the United States Circuit Court at Philadelphia, alleging infringement of signal patents.

The Rhode Island Free Bicycle Law.

The Rhode Island Legislature, lately adjourned, passed only one law affecting railroads, and that was the bicycle bill, already noted in these columns. It is different in details from the bills passed in New York and Ohio, and reads as follows. (It is Section 9 of Chapter 187 of the general railroad laws.)

"Every passenger upon a railroad within the limits of this state shall have the privilege of taking with him upon any train on which he is a passenger, personal baggage not exceeding eighty pounds in weight, without any charge on the part of the railroad company transporting the same, except the railroad fare of such passenger; and bicycles are hereby declared to be, and are decreed to be baggage, within the meaning of this section, and shall be by such railroad companies transported as baggage, subject to the same liabilities; provided, however, that no railroad company shall be required to transport more than one bicycle for a single person, and no such passenger shall be required to crate, cover or otherwise protect any such bicycle."

Fifty Passengers Killed in British Columbia.

A press dispatch of May 26 reported the drowning of 50 or more passengers in an electric street car at Victoria, B. C. A car packed full of passengers, with many on the outside, about 80 altogether, ran off the track while crossing the Point Ellice bridge, about 2 p. m., and fell into the water, said to be about 75 ft. below the floor of the bridge. Many of the occupants of the car swam to points of safety, but most of those inside were drowned. Nothing is said about the cause of the derailment or the character of the bridge, though the fact that a considerable portion of the structure fell into the water with the car, would seem to indicate that it was made of wood.

British Iron Trade.

A meeting of the British Iron Trade Association was held in London on the 6th. A paper which attracted a good deal of attention was by Mr. Jacks on "Some Thoughts on Continental Competition." Mr. Jacks pointed out the great change in the proportion of the world's pig iron produced in different countries. For example, in 1871 Great Britain produced 6,627,000 tons, and in 1893 6,830,000. In the same years the United States produced 1,730,000 and 7,125,000; and Germany produced 1,278,000 and 4,700,000. In 1871 Great Britain supplied over one half of the total quantity of pig iron, and in 1893 only a little over one-quarter. These figures, together with the steadily decreasing use of British coal in Germany, with the announcement that coal in Westphalia is being brought to London, and with the equally serious fact that American pig iron is now being regularly sold in some parts of England, "indicate an amazing and uncomfortable change in our industrial and commercial conditions." In seeking the cause of the change Mr. Jacks pointed out that wages in England are much higher than on the Continent. This, however, could not be ascribed as the controlling cause, for German iron and steel were sold in Belgium, where wages are considerably lower than in Germany, and Alabama pig iron is sold in Great Britain. He appeared to think that a great cause for the change is in the superior activity and intelligence of the Germans in capturing the foreign markets. But beyond all this the English iron and steel industry is suffering from the paralyzing effects of frequent and prolonged strikes. In the discussion several speakers pointed out the importance of adopting the metric system of weights and measures, in order the better to enter foreign markets.

The Foreign Locomotive Industry.

The London Iron and Steel Trades Journal says: "Speaking generally, the locomotive building trade of this country is just now in a comparatively satisfactory position. New work continues to be given out sufficient to keep the majority of the works busy. Among the contracts in hand, there is one for 40 locomotives for Queensland, while several locomotives are in course of construction, both for railways in Sierra Leone and Lagos. There is a large amount of work in hand for Western Australia and South Africa, while contracts lately placed include a number for India and a lot for Japan, Messrs. Beyer, Peacock & Co., Manchester, being the favored firm as regards the Japanese orders. Taken altogether, the export trade during the past month must be considered to have been fairly satisfactory, seeing that it shows an increase, not over the preceding month, but over the corresponding period of the previous two years. The figures are: March, 1896, £76,508; February, 1896, £66,554; March, 1895, £63,622; and March, 1894, £49,053. There was a large decrease in the shipments to the continent, the value standing at only £3,351, as against £6,644 in March last year. This decline is principally due to the diminished demands of Spain, the locomotives exported to that country having been valued at £822 last month, as compared with £3,570 in the corresponding period of last year. Trade in locomotives with Russia continues practically a blank. The Russian Government has just now a number of orders to give out for locomotives, and is at present in negotiation with German builders with reference to a lot of 300. Two further sections of the Trans-Siberian Railway are to be opened for traffic during 1897 and the estimates of the authorities of the rolling stock required for the operation of these two sections includes nearly 200 locomotives.

"German locomotive builders are just now exceedingly well employed, both on engines for the Prussian state railways and for the Russian Government, and it is probable that in the case of the orders above mentioned they may be unable to meet the conditions as regards time of delivery.

"The British East Indies have for some time past been our best customer for locomotives, but the programme of railway construction is apparently approaching completion, as the exports of locomotives have lately been steadily declining, the value last week being recorded as only £6,908, as compared with £10,854 in February last and £24,485 in March last year.

"On the other hand, trade with South American countries is being maintained at a fairly satisfactory level, the total for the last month being £20,254, the respective returns for the preceding month and March, 1895, being £16,191 and £19,673."

Bridges Destroyed by Storms.

Severe tornadoes and floods have been reported from many different places during the past week, scores of lives being lost in Iowa and other states. A dispatch from Des Moines says that the Illinois Central lost 30 bridges between Dubuque and Le Mars. In the region of North McGregor, Ia., the Chicago, Milwaukee & St. Paul had its track washed out for 10 miles, and a flood in the Bloody Run floated many freight cars down stream. The total loss to the railroad company was estimated at \$100,000. A dispatch from Oelwein states that the Chicago Great Western lost several bridges and many miles of telegraph line. The Chicago & Northwestern suffered great damage to the roadbed and the loss of bridges near La Moille. A report from Eldorado says that a washout occurred on the Iowa Central causing a number of delays. A number of bridges over Lind Creek, near Marshalltown, were carried away. At Forbes and Forest City, Mo., a cloudburst occurred causing a washout on the Kansas City, St. Joseph & Council Bluffs Railroad. Eldon, Mo., was struck by a tornado, and the tracks of the Lebanon branch of the Missouri Pacific were washed out. At Waraw, Mo., there have been extensive washouts on the Sedalia, Warsaw & Southwestern Railroad. Near Renick several miles of telegraph poles were destroyed and a bridge on the Chicago & Alton was washed out. Between Red Lake Falls and Lambert, Minn., seven bridges have been carried away. From Oklahoma City, Okla., it is reported that 11 bridges have been washed away, and 10 miles of track of the Choctaw, Oklahoma & Gulf was inundated. Several bridges were washed away at Galena, Ill., and at Mt. Carroll, in the same state, several iron bridges were swept away.

LOCOMOTIVE BUILDING.

A contract has been awarded by the Baltimore & Ohio to the Richmond Locomotive Works, Richmond, Va., for 25 locomotives, and one to the Baldwin Locomotive Works, Philadelphia, for the same number. The engines ordered are to be delivered in July, August and September.

The contract of the Baldwin Locomotive Works for 25 locomotives for the Lehigh Valley was noted in this column last week. Of these engines, 20 are to be ten-wheeled freight engines and the remaining five of a special design for fast passenger service. The latter will be used to run the new fast train, the "Black Diamond Express." The cylinders of these locomotives are to be 19 x 26 in. and the driving wheels 76 in. in diameter. The engines will burn anthracite coal.

The locomotive order of the Southern Railway referred to last week was for 10 consolidation engines, six being awarded to the Brooks Locomotive Works and four to the Richmond Locomotive Works. None was awarded to the Pittsburgh Works as stated. The engines have 20 in. 26 in. cylinders and 56-in. driving-wheels with Latrobe steel tires. Westinghouse and American brakes will be used on all driving-wheels and tender wheels. The valves are the Richardson balanced, and the springs will be made by the A. French Spring Company. Nathan sight feed lubricators and Monitor injectors will be used. National hollow brake-beams will be used on the tenders. The tender capacity is six tons of coal and 4,200 gallons of water.

CAR BUILDING.

The Lebanon Manufacturing Co. has completed all of the 500 cars for the Philadelphia & Reading awarded about one month ago.

About 100 refrigerator cars, for use during the fruit shipping season, are being fitted up at the Philadelphia Wilmington & Baltimore shops at Wilmington.

The Pullman Palace Car Co. has been awarded the contract for building 20 coaches for the New York & Brooklyn Bridge. The cars are to be 48 ft. long, equipped with electric motors and will cost \$3,200 each.

Four new sleeping cars have just been sent from the Wagner Palace Car shops, at East Buffalo, to St. Paul, Minn., for use on the Chicago, St. Paul, Minneapolis & Omaha. These are the first Wagner cars used on the road.

The Billmeyer & Small Car Co., York, Pa., is building four cars for South America, to be used for excursion purposes on a railroad in Bolivia. They are also building four others for Venezuela. These cars are also adapted for carrying sugar cane.

Among the articles specified on the cars recently ordered by the Baltimore & Ohio are the Buckeye couplers and Westinghouse brakes on the entire 5,000 cars. Dunham doors will be used on all the box cars, Davis pressed steel box lids, the Schoen bolster, Chicago roof, and the springs will be of the French, Pickering & Scott makes.

BRIDGE BUILDING.

Atlanta, Ga.—It is stated that bids will be received until June 15 for the substructure for the Peachtree Creek bridge. A. L. Kontz is Clerk of the Commissioners of Roads and Revenues.

Burlington, Ia.—It is reported that the Council will soon advertise for bids for building a bridge over the Cascades.

Calvert, Tex.—The commissioners have granted an appropriation of \$13,000 for building another bridge across the Brazos River. The citizens of Calvert agree to pay \$3,000 toward the work. It is said that the contract has already been awarded.

Cincinnati, O.—Frank Krug, the County Engineer, it is said, has been directed to prepare plans and specifications for a new bridge on Sharon avenue.

Columbus, O.—The County Commissioners, according to reports, will erect a bridge on the Johnstown pike over the tracks of the Baltimore & Ohio.

Confluence, Pa.—It is reported that the Commissioners of Fayette and Somerset counties have adopted the plans and specifications of the King Bridge Co. for the new bridge over the Youghiogheny River.

Currie, Minn.—Bids will be received until June 23 for building a concrete arch or iron bridge with masonry foundations. W. H. Mellen is chairman of the Township Board.

Denver, Colo.—Plans are being prepared for 140-ft. bridge at Lawrence street and for a new bridge at

Stout street. The estimated cost of the first is \$10,500 and of the second \$5,000.

East Boston, Mass.—The bridge at Meridian street, which has been closed to traffic, will be rebuilt.

Florence, Ala.—Press reports say that the bridge over Sinking Creek collapsed May 7, without any apparent cause.

Flushing, N. Y.—Bids will be received till June 1 for building a highway bridge and foundations over Flushing Creek. G. A. Roullier is engineer.

Gaylor, Mont.—The County Clerk has advertised for bids for building an iron bridge over the Jefferson River. There will be three spans of 116 ft. each.

Glenwood, Minn.—A bill has been passed in Congress authorizing the North Dakota & Minnesota Railroad Co. to build a bridge over the Red River of the North.

Guelph, Ont.—The City Engineer has prepared plans and will call for bids for an iron foot bridge of two spans, 96 ft. each, over the Speed River. The estimated cost is \$1,500.

The construction of two new steel bridges has been recommended by the Guelph City Council.

Hull, Que.—The Wakefield Council has decided to build an iron bridge over the Peche, at a cost of \$2,500.

Jefferson City, Mo.—The draw bridge over the Missouri River was opened to traffic last week. The total length of the bridge is 1,745 ft. and of the drawn span 440 ft. The bridge was built by the Missouri Valley Bridge & Iron Works, of Leavenworth, Kan., for \$250,000. J. A. L. Waddell was the chief engineer for the work.

Lewiston, Idaho.—The Lewiston Water & Power Co. has asked the City Council for a 15-year exclusive franchise for a bridge across the Snake River, to cost not less than \$50,000.

Lewiston, N. Y.—The President has signed the acts to authorize the construction of a bridge over Niagara River at Lewiston. This will enable the company to begin work, as the right has already been obtained from the Dominion Parliament.

Listowell, Ont.—Bids will be received for the construction of a bridge over the Maitland River.

McKeesport, Pa.—Application will soon be made for a charter by the Central Bridge Co., which proposes to build a bridge over the Monongahela River. The estimated cost of the bridge is \$200,000.

Morganton, N. C.—The Commissioners of Burke County have let the contracts for building the two iron bridges, noted in these columns last month, across the Catawba and John rivers to the Youngstown Bridge Co., of Youngstown, O. Fourteen bids were received.

New York.—Governor Morton has signed the bill authorizing the bridge over the New York & Harlem Railroad, connecting Melrose avenue from East 163d street to the junction of Webster and Brook avenues at East 165th street.

The four-track drawbridge of the New York Central & Hudson River Railroad over the Harlem River has been completed and tested. At first a great deal of friction was developed in turning the bridge, and it was found that the tubes for carrying oil to the gearing were too small to permit the oil to flow freely. This has been remedied and the bridge now works perfectly. It will not be in use for sometime, however, as the viaduct will not be finished till about July 1. This bridge was fully described and illustrated in our issue of Feb. 21.

Ottawa, Ont.—Mr. J. R. Booth has awarded the contract for a steel bridge at the terminus of the Ottawa, Arnprior & Parry Sound Railroad to Messrs. Brewer & McNaughton, of Ottawa. The amount of contract is between \$25,000 and \$30,000. The bridge will be 300 ft. long.

Paterson, N. Y.—It is reported that the Board of Freeholders has refused to sanction the building of the concrete bridge over the Passaic River.

Peterborough, Ont.—Government engineers are preparing plans for a railroad bridge across the river at Auburn.

Phippsburg, Me.—The town has voted \$750 toward the construction of the bridge across Morse's River. The bridge will probably cost about \$1,500.

Pittsburgh, Pa.—Two bridges are to be built in Schenley Park at an estimated cost of from \$300,000 to \$450,000. One of the bridges will be a stone arch and the other probably a metal one. It is said that Director Bigelow will advertise for bids immediately.

A bill has been introduced in the Senate authorizing the Butler & Pittsburgh Railroad Company to build a bridge over the Allegheny River northeast of the eastern limits of Pittsburgh.

Providence, R. I.—The Council has been petitioned to build a steel viaduct at South Main street. It is estimated that it will cost about \$100,000.

St. Charles, Mo.—The St. Charles & St. Louis County Bridge Co. has been incorporated with a capital of \$2,000 by Theodore B. Ruere, Henry F. Peiper, C. W. Prosser and others for building a bridge over the Missouri River at St. Charles. It is stated in the bill that the bridge is not to be built nearer than one-third of a mile to any existing bridge.

Scranton, Pa.—The County Surveyor has completed plans for three bridges to be erected this summer in Ramson, Covington and Clinton townships. The total estimated cost is \$2,500.

Sharon, Pa.—The County Commissioners have decided upon sites of bridges as follows: One of 20-ft. span in Pine Township; one of 27-ft. span over Indian Run, in Wilmington Township; one of 33-ft. span over McCullough Run, and one near Gilkey's, in East Lackawannock Township; one of 30-ft. span over Pine Run in Hickory Township; one of 40-ft. span in Delaware Township, near Hamburg; and two in Delaware and Sugar Grove townships.

Southport, Me.—A permit has been granted by the War Department to the selectmen of Southport to build a wooden bridge over Townsend Gut.

Reedley, Cal.—Borings are being made in the Kings River for finding the depth required for the foundations for the bridge which will probably be built about next October.

Washington, D. C.—The House Committee has made a favorable report upon the bill to allow the Texarkana & Fort Smith Railroad Co. to build a bridge across the Sulphur River in Arkansas.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Maine, \$1.50 per share on common stock, payable May 29.
Central Massachusetts, 75 cents per share on the preferred stock, payable June 1.
Cleveland, Lorain & Wheeling, 1 per cent, on the preferred stock, payable June 15.
Morrell & Andover, 4 per cent, payable June 1.
Mexican Northern, quarterly, 1 per cent., payable June 2.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Butte, Anaconda & Pacific, annual, Anaconda, Mont., June 2.
Calgary & Edmonton, special, Windsor Hotel, Montreal, Que., June 10.
Canada Southern, annual, St. Thomas, Ont., June 5.
Chateaugay, annual, Plattsburgh, N. Y., May 30.
Chicago & Eastern Illinois, annual, company's office, Chicago, June 3.
Chicago & North Western, annual, company's office, Chicago, June 4.
Chicago & Western Indiana, annual, company's office, Chicago, June 2.
Chicago, Rock Island & Pacific, annual, company's office, Chicago, June 3.
Chicago, St. Paul, Minneapolis & Omaha, annual, company's office, Hudson, Wis., June 6.
Des Moines & Fort Dodge, annual, company's office, Des Moines, Ia., June 4.
Duluth & Iron Range, annual, company's office, Duluth, Minn., June 8.
Duluth, South Shore & Atlantic, annual, company's office, Marquette, Mich., June 4.
Kanawha & Michigan, annual, Corning, O., June 2.
Keokuk & Des Moines, annual, company's office, Des Moines, Ia., June 3.
Michigan Midland & Canada, annual, Michigan Central office, Detroit, Mich., June 4.
Montreal & Western, annual, company's office, 162 St. James' street, Montreal, June 4.
Northern Railroad of New Jersey, annual, company's office, Englewood, N. J.
Vermont & Massachusetts, annual, Treasurer's office, 53 Devonshire street, Boston, Mass.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Roadmasters' Association of America* will hold its next annual meeting at the Cataract Hotel, Niagara Falls, N. Y., beginning Sept. 8.
The *American Society of Civil Engineers* will hold its annual convention at San Francisco, beginning on or about June 30.
The *American Society of Mechanical Engineers* will hold its annual convention at the Southern Hotel, St. Louis, May 19 to 22. The programme of the meeting was published in the *Railroad Gazette* of April 24.
The *Traveling Engineers' Association* will hold its next annual meeting at Minneapolis, Minn., commencing Sept. 8.
The *Master Car Builders' Association* will hold its next convention at Congress Hall, Saratoga Springs, N. Y., beginning June 17. The rates at Congress Hall are \$3 a day for single rooms.
The *Master Mechanics' Association* will hold its next annual convention at Congress Hall, Saratoga Springs, beginning June 22.
The *Roadmasters' Association of America* will hold its next annual convention at Niagara Falls, beginning on Sept. 8.
The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago. Mr. George M. Basford, is secretary, The Rookery, Chicago.
The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.
The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.
The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.
The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.
The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.
The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.
The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.
The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.
The *Western Society of Engineers* meets on the first Tuesday in each month, at 8 p. m. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago. The business meetings are held on the first Wednesday at its rooms. The meetings for the reading and discussion of papers are held on the third Wednesday at the Armour Institute, Thirty-third street and Armour avenue.
The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.
The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.
The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.
The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.
The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7:30 p. m.
The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.
The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 5 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Bock, Denver, Col., on the second Tuesday of each month except during July and August.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary of the association.

The *Engineers' Club of Columbus*, (O.), meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Engineers' Society of Western New York* meets on the first Monday of each month at the Society's rooms in the Buffalo Library.

Canadian Society of Civil Engineers.

A meeting of this society will be held in Toronto on June 17, 18 and 19, next. It has been decided to make this a special general meeting in order that the question of the incorporation of the society and other matters of business may be discussed and acted upon. It is expected that at least two sessions will be devoted to the reading of papers and discussions thereon. An excursion will be made to Niagara Falls and should time permit other points of interest in the vicinity of Toronto will be visited.
Transportation rates will be half regular fare.

National Association of Local Freight Agents' Associations.

The ninth annual convention of this association will be held at the Tremont House, Chicago, on Tuesday, June 9. Some of the topics for discussion are: "Seniority in Making Promotions," "Proposed Code of Definitions of Traffic Terms Used in Railway Accounting," "Should Yard Clerks be Under the Control of Agent or Yardmaster?" "Should Car Service be Collected by the Car Service Association or by the Local Agents?" "Is it Profitable or Desirable to Handle Cars of Mixed Shipments between Factories, Warehouses and Freight Depots?" "What is the Best System of Checking and Loading Freight and Noting Discrepancies, Locating Causes of Wrong Loading and Overs and Shorts?"
The Secretary of the Association is Jas. V. Braden, Wheeling, W. Va.

New York Railroad Club.

At the meeting of this club on May 21, Mr. Molineux read a paper on the use of blank drivers on locomotives. Mr. Molineux was strongly in favor of flanging all driving wheels. He said that such a practice gave a considerably increased tractive power, the first cost was less and he enumerated a number of other advantages. All the speakers at the meeting, except Mr. Mitchell, of the Erie, favored the use of flanges on all driving wheels. Mr. Lewis, of the Delaware, Lackawanna & Western, said that his company had flanged all locomotive tires since 1872. Mr. Blackall, of the Delaware & Hudson, said that the engines of his company had flanges on all driving wheels. Mr. Medway, of the Pitchburg, Mr. West, of the New York, Ontario & Western, and Mr. Segue, of the Schenectady Locomotive Works, also considered the use of flanges on all driving wheels the better practice. Mr. Mitchell said that the Erie used blank tires on the second pair of driving wheels on its consolidation engines, and he was not convinced that the use of flanges on all wheels gave any advantages.

Southern & Southwestern Railway Club.

A regular meeting was held April 16, Vice-President W. H. Thomas in the chair. The subjects for discussion were: "Locomotive Fire Kindling," "Applying Air-Brakes to Hopper Gondola Cars," "The Devil Track Brake" and "H Cross Heads." Abstracts of the discussions on these various topics will be published in this issue or in succeeding ones.

The subjects for special discussion at the next meeting will be: "The Present State of the Art of Kindling Locomotive Fires with Oils," Messrs. W. L. Tracy, P. H. Schreiber and E. T. Silvius, Special Committee; "To investigate and report on the relative merits of using the Prosser or Jenny expanders as compared with the roller expanders, with special reference to the effect on the flue sheets and holding power of the flues in the sheets"; "To recommend some simple method for ascertaining when a locomotive boiler tube is too old to be worth having a new end welded on for using again." A paper on the "Relative Value of Steel and Chilled Wheels" will be presented. The next regular meeting will be held on Aug. 20, 1896, at 10 o'clock a. m.

American Society of Civil Engineers.

At the regular meeting of Wednesday evening, the 20th, Mr. Theodore Cooper read a paper on "Ocean Waves and Wave Force," which had already been printed and distributed for discussion. The paper is an important summary of knowledge and theory on the subject.

At the next regular meeting, June 3, Prof. W. H. Burr will read a paper on "Driving Piles Through New Stone Filled Cribbs."

The programme of the 28th annual convention to be held in San Francisco June 29 to July 3 is issued. Those who had signified their intention to attend numbered 143 members, of whom 104 live east of the Mississippi River. The number to go from the East will warrant a special train, which will leave New York June 22. The excursion will be under the direction of Messrs. Raymond & Whitcomb, and a number of itineraries are arranged. The quickest and cheapest covers the time from June 22 to July 1, and will cost \$212. This includes transporta-

tion, sleeping car accommodations, meals on dining cars or at stations; hotel accommodations at Manitou and San Francisco and transfer of baggage. Other itineraries are arranged, the longest and most expensive of which includes the Yosemite, Alaska, Yellowstone Park, Niagara Falls and a great many other points of interest. The cost of this will be \$575.

The British Iron and Steel Institute.

The twenty-seventh annual meeting of the Iron and Steel Institute was held in London in the house of the Institution of Civil Engineers, May 7 and 8. The President, Sir David Dale, was too ill to attend and Sir Lowthian Bell took the chair. The Bessemer gold medal was awarded to Dr. Hermann Wedding, Professor in the School of Mines at Berlin, in recognition of his services to the iron and steel industry by his valuable contributions to metallurgical literature. The Chairman in an address on presenting this medal said that out of the 24 medalists, 10 were of foreign birth. Dr. Wedding in receiving the medal said that he was the first German citizen on whom it had been bestowed.

A paper by Mr. Benjamin James Hall on the "Ford and Moncur Hot Blast Stove" was read by the author and was discussed by the members, the discussion being opened by Mr. Whitwell.

A long and very important paper by Baron Hanns Juptner von Jorntstoff, of Neuberg, Austria, on the "Introduction of Standard Methods of Analysis" was read and discussed. The author pointed out the great divergence between analyses of different chemists often in the same laboratory. He spoke, for instance, of an analysis of a sample of a chill roll in which the carbon was given by one chemist as 3.5 and by another as 2.785; the silicon as 1.5 and as 0.668; the manganese as 2.4 and as "a trace." The list of papers to be presented was published in a recent issue of this journal.

PERSONAL.

—Mr. A. S. Norton, formerly Auditor of Disbursements of the Northern Pacific, has been made Assistant General Auditor.

—Mr. Henry G. Withrow, Assistant Superintendent of Motive Power of the Metropolitan Elevated Railroad, died at Chicago last week.

—Mr. F. S. Wallace has resigned his position as Superintendent of the Chattanooga Southern road. Mr. Wallace has been Chief Engineer for some years, and became Superintendent about a year ago under the receiver.

—Mr. John Copeland, Superintendent of Bridges and Buildings of the Chicago, St. Paul, Minneapolis & Omaha at St. Paul, has been transferred to Eau Claire, Wis., as Superintendent of Bridges and Buildings, to succeed Mr. Benjamin Shute, deceased.

—Mr. G. H. Moore has been appointed Auditor of the Galveston, Houston & Henderson road, with headquarters at Galveston, Tex. Mr. Moore is now and for several years has been Chief Clerk in the General Auditor's office of the St. Louis & San Francisco.

—Mr. John J. Archer, for a number of years Assistant General Freight Agent of the Norfolk & Western at Portsmouth, O., has been appointed Assistant General Freight and Passenger Agent of the Ohio River road, with headquarters at Parkersburg, W. Va., beginning June 1.

—Mr. John Scott, General Agent for the passenger department of the Kansas City, Fort Scott & Memphis at Kansas City, has resigned to become Division Passenger Agent for the Illinois Central, the Yazoo & Mississippi Valley and the Chesapeake, Ohio & Southwestern at Memphis, vice Mr. James Binkins.

—Mr. Timothy W. Hammond, of Worcester, who on April 1 completed his 49th year of service as treasurer of the Worcester, Nashua & Rochester Railroad Company, has resigned the office. Mr. Hammond is 82 years old, and is undoubtedly one of the oldest railroad officials in point of service in the country.

—Mr. John F. O'Rourke has associated himself with Mr. Clinton Stephens under the firm name of Stephens & O'Rourke, Engineers and Contractors, 44 Broadway, New York. The firm now has in hand the contract for the foundations and steel grillage of the important new building to be erected at the corner of Nassau and Wall streets.

—Mr. J. J. Ford has been appointed General Western Freight Agent for the Michigan Central Road, with offices at Denver, Colo., and Mr. James A. Gill has been appointed to the same position, with offices at Sacramento and San Francisco, Cal. Both of these offices are now first created, the Michigan Central never before being represented west of the Missouri River.

—Mr. Charles W. Tomlinson, General Agent of the B. & O. S. W. fast freight line at St. Louis, and also of the Central States Dispatch and Continental Fast Freight lines, has resigned to become Secretary of the National Surety Co. in Kansas City. Mr. Tomlinson has been connected with the B. & O. S. W. for about six years. He was previously with the B. & O. for about 15 years.

—Mr. Samuel Hunt, of Cincinnati, has been elected a director of the Choctaw, Oklahoma & Gulf road, vice Charles Biddle, of Philadelphia, resigned. Mr. Hunt is President and General Manager of the Cincinnati, Portsmouth & Virginia and Ohio River & Charleston roads. He is also General Manager of the Northern Alabama and the Brockville, Westport & Sault Ste. Marie in Canada, and is Vice-President of the Dayton, Lebanon & Cincinnati. He will represent the interests of the Investment Company of Philadelphia.

—Mr. James H. Stanwood, of the Massachusetts Institute of Technology, died at his home in Boston last Sunday evening. Professor Stanwood was 34 years of age, a man of hardy and robust physique and much physical and mental energy, and his death seems particularly untimely. He was instructor in Civil Engineering in the Institute, and was especially known to our readers as having been an occasional and valued contributor to our columns. He was a member of the American Society of Civil Engineers, and of the Boston Society of Civil Engineers.

—Mr. A. B. Underhill, formerly Superintendent of Motive Power of the Boston & Albany, died at his home in Springfield, Mass., on May 24, at the age of 64. He had been in poor health for several years. Mr. Underhill was born at Chester, N. H., and was apprenticed to Mr. J. M. Stone when about 13 years old. Mr. Stone soon after started the Manchester Locomotive Works, and Mr. Underhill remained with him in that establishment until 1855. Subsequently he was with the Hinkley Works at Boston, and also for a short time on the P. & N.

Iantie & Great Western.—At Meadville, Pa. He went to the Boston & Worcester as Master Mechanic in 1864, and remained with that company and its successor, the Boston & Albany, until 1883, when he resigned on account of ill health. He was appointed Superintendent of Motive Power in 1880.

—Gen. John Echols, Receiver of the Chesapeake, Ohio & Southern road, died last week. General Echols was a lawyer by education, but for many years past had been closely identified with railroad management. In 1838 he was elected a Director of the Chesapeake & Ohio road, then operated between Richmond and Covington, Va., and since then he has been identified in one capacity or another with the railroad properties of Mr. C. P. Huntington east of the Mississippi River. He remained chiefly identified with the Chesapeake & Ohio for some years, but later became a Vice-President of the Chesapeake, Ohio & Southwestern and of the Newport News & Mississippi Valley Company and of the Elizabethtown, Lexington & Big Sandy and the Kentucky Central, and other subsidiary companies. Recently he has been Receiver of the Chesapeake, Ohio & Southwestern, also continuing to act as General Manager.

ELECTIONS AND APPOINTMENTS.

Lima North rn.—E. P. Hathaway has been appointed Auditor with headquarters in Lima, O.

Marshfield & Southeastern.—Charles H. Grundy has been appointed General Manager of the road, with headquarters at Marshfield, Wis., in place of Mr. A. A. Hopkins.

Missouri, Kansas & Texas.—The annual meeting of the stockholders took place at Parsons, Kan., on May 20. At a meeting of the stockholders 458,402 shares were represented. The four directors whose term of office expired to-day were re-elected, viz.: Henry Poor, Thomas C. Purdy, Simon Sterne and B. P. McDonald.

Pittsburgh, Fort Wayne & Chicago.—At the annual meeting at Pittsburgh, on May 20, the following directors were elected: Charles Lanier, Henry Amy and William C. Eggleston, of New York, and James McCrea, First Vice-President of the Pennsylvania Company. The Board is now composed of the four named with the following: Charles E. Speer, Edward P. Williams, John S. Kennedy, John N. Hutchinson, Henry C. Urner, Levi Z. Leiter, John Sherman, Learner B. Harrison and George B. Roberts.

The annual meeting of the stock and bondholders was held at Pittsburgh, May 20, and the following directors, whose terms expire this year, were re-elected: Charles Lanier, Henry Amy, William C. Eggleston, of New York, and James McCrea, of Pittsburgh.

Ravenswood, Spencer & Glenview.—At a meeting of the stockholders at Glenview, W. Va., on Thursday of last week the following directors were elected: George A. Burt, Parkersburg, W. Va.; J. L. Armstrong, Ravenswood, W. Va.; P. C. Adams, G. P. Stone, and D. W. Chapman, of Spencer, W. Va. Mr. K. Burt represents the interests of the Ohio River road, and will be President.

Wagner Palace Car Co.—The following promotions and changes have been announced: R. A. Wilson, District Superintendent at Kansas City, transferred to St. Paul district in same capacity; C. J. Simpson, Assistant District Superintendent Chicago & Northwestern district, promoted to be District Superintendent at Kansas City, vice Wilson, transferred; W. S. Collins, Agent at Denison, promoted to be District Superintendent at same station; T. L. Montgomery, Assistant District Superintendent at St. Louis, transferred to Chicago & Northwestern district, Chicago, in same capacity, vice Simpson, transferred; J. W. Aurelius, Night Agent at Chicago & Northwestern district, transferred to St. Louis district, and promoted to be Assistant District Superintendent, vice Montgomery, transferred; F. W. Hallock, Night Agent, St. Louis, promoted to be Agent at Indianapolis. The offices at St. Paul and Minneapolis are new ones and have just been established.

Williamsport & North Branch.—At the annual meeting in Hughesville, Pa., May 20, Hon. H. C. McCormick was re-elected President, while the following Board of Directors was elected: George B. Foran, Buffalo; Seth T. McCormick, Williamsport; R. E. Evenson, Hughesville; J. Raymond Claghorn, Philadelphia, and E. R. Payne, Williamsport. No Vice-President was elected at the meeting.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Baltimore & Ohio.—A contract has been awarded to Stewart & Keenan for straightening the road at the "Seven Curves," near Cumberland, Md. The changes will give a nearly straight line and will cost about \$50,000. A number of other improvements will shortly be made by the receivers.

There will also be expended this summer for improvements on the main line and branches \$75,000 in straightening out curves at Patterson Creek, \$475,000 for new rails, \$440,000 for renewals of bridges and \$75,000 for tunnels and masonry.

Belington & Little Laurel.—Superintendent F. P. Reese, of this West Virginia road, with Capt. J. C. Black, Chief Engineer, and a party of engineers, are at work in the Laurel Creek region, up from Monroe, on Little Laurel Creek road, with a view to building a short line, from Monroe, up through the district underlain by the "Fourteen-foot vein" of coal, which crops out along Laurel Creek, and is worked extensively on the West Virginia Central & Pittsburgh. Within the past few weeks large sales of this tract have been made to the Berwyn, White Mining Co., of New York and Pennsylvania, and others. It is the intention to build a road to open these coal lands by next fall.

Bellefonte & Clearfield.—The survey of this road, from Bellefonte, Pa., to Phillipsburg, has been completed. This road is an extension of the Central of Pennsylvania from Mill Hall, in Clinton County, to Bellefonte. The survey to Phillipsburg goes up the Bald Eagle Valley as far as Unionville, where it crosses the Alleghenies, following the course of Dix run. This route will require one tunnel. The total length of the road is 56 miles.

Boulder County.—Surveyors are now at work running lines for a system of narrow-gauge railroads in Boulder County. One line follows Boulder Canon to Four Mile Creek, then up that creek by Salida, and to Ward. A good grade, it is said, has been secured. The gage is to be cut 24 in. The rolling stock is to come from the Lima Locomotive Works in Ohio. The object is mainly to bring ore to Boulder for treatment, and to

haul freight, mining supplies and produce into the mountains. The line to Ward alone will be about 30 miles.

Central Vermont.—The receivers have petitioned the United States Court for authority to purchase 2,500 tons of rails to cost \$75,000, to purchase ties costing \$100,000, to complete the building of bridges at large expense and to purchase new passenger equipment to cost \$67,500. Bondholders and creditors opposed the petition.

Charleston, Clendennin & Sutton.—Contractors Wadew & Johnson, Swift, Vandegrift & Jacobs, and Joseph Peyton have 300 men at work grading, building bridge foundations, and preparing roadbed on 18 miles of this road, north of Clendennin, W. Va. The plans and surveys from the end of the 18 miles mentioned toward Sutton are being finished up, and the contracts for grading are to be let before long. The road will be ready to haul passengers to Clay C. H. early in August. The superstructure for a 200-ft. bridge, to span Buffalo Creek, was unloaded from the cars there last week, and will be put in place at once, the foundations having been completed.

Chicago & West Michigan.—Charles M. Heald, General Manager, in the last annual report calls attention to some of the needs of the road, as follows: "The wooden bridge over the Grand River at Grand Rapids should be built with an iron structure upon stone abutments and piers this coming year. The present structure cannot be kept in condition for use much longer. Ten miles of new rail, 70 lbs to the yard, should be placed in the track during the year. The old rails released are badly needed to increase the length and improve the condition of passing and side tracks. All new rails provided for the main track should be laid in connection with tie plates. New passenger stations are required at St. Joseph, Benton Harbor, Zeeland and White Cloud."

Cleveland Belt & Terminal.—There is some talk that this road may extend its line from the present western terminus, which is a junction with the Big Four, still further westward to a connection with the Lake Shore & Michigan Southern.

Gray's Point Terminal.—This company has been incorporated in Missouri. It is organized to build a standard gage road from Delta, in Cape Girardeau County, in an easterly direction to Gray's Point, on the Mississippi River, in Scott County, a distance of 15 miles. The directors of the company are Samuel W. Fordyce, Joseph Dickson, S. H. West and S. C. Johnson, of St. Louis, and B. F. Johnson, of St. Elmo, Ill. The general offices of the company are to be in St. Louis.

Hampton & Branchville.—About 20 miles of this road is now in operation and a three-mile branch will be undertaken shortly. The company was organized by W. H. Maudlin & Sons and took over about eight miles of road built by that firm to reach timber lands in Colleton County, S. C. This company has now completed over 20 miles of road to Madlinton, near Carter's Ford, on the Salkehatchie River, in Colleton County, S. C. A three-mile branch will be built at once to open up a timber district. A further extension of two miles will bring this branch to Ehrhardt's, in Barnwell County, S. C. A 60-lb. steel rail is now being laid on the main line and on June 1 a passenger and mail train will be put on.

Hoxie, Pocahontas & Northern.—This company has been recently organized in Arkansas. It is proposed to build the road from Hoxie to Pocahontas, a distance of 15 miles. The capital stock of the company is \$100,000. The Board of Directors consists of Maxwell Coffin, S. C. Dowell, Gordon N. Pray, William Kavanaugh, John W. Blackwood and Charles Coffin.

Kansas City & Northern Connecting.—President A. E. Stillwell, of this company and the Kansas City, Pittsburgh & Gulf road, in whose interest the new road is projected, has just returned to Kansas City from Europe and states that he has arranged for financing the project. The construction of the line will be pushed as soon as contracts can be let. The new connecting road will connect with the Omaha & St. Louis road at Pattonsburg, and the Kansas City, Quincy & Omaha at Trenton. Connection will also probably be made with the Des Moines & Kansas City, at Cainesville. Thus a new route is formed from Kansas City to Omaha, Des Moines and Quincy.

Lehigh Valley.—Engineers are surveying a short line to connect Ashland, Pa., with the company's main line.

Lima Northern.—The roadbed has been completed from Lima, O., north to a point within four miles of the Michigan state line, and the rails are laid five miles north of Napoleon. The present terminus of the road, as projected, will be Detroit Junction, a station four miles west of Detroit on the Lake Shore road. The trains of the Lima Northern will run into Detroit over the tracks of the Lake Shore & Michigan Southern.

Mexican Industrial.—This company, in which Boston interests are largely represented, has been organized to build a 12-mile belt line in the city of Mexico to connect the Mexican Central, Mexican Railway Limited, Inter-oceanic, Mexican Cuernavaca & Pacific and Mexican National and interchange traffic between the roads mentioned. With the exception of the Mexican National, these roads guarantee six per cent. interest in gold on the cost of the road. The new company will also have the hauling of hogs and cattle as delivered by the above roads to the government stockyards, as well as a large tonnage from the peat fields of Lago de Cochemilcho, to which district a line of road is later to be built. To provide money for the actual cost of the construction and equipment of the line it is proposed to issue 30-year six per cent. bonds at 95, and with each \$1,000 bond four shares of stock are to be given. At present only \$150,000 stock will be issued. About three kilometers of the road have already been constructed, and it is planned to have the entire line in operation by Sept. 30. The officers are as follows: President, S. W. Reynolds, formerly Treasurer Mexican Central Railroad; Walter S. Wait, Boston, Vice-President; John Clark, Boston, Treasurer; Edward H. Whorf, Mexico, General Manager.

Michigan Central.—The company has awarded a contract for a 19-mile extension of the Mackinaw Division to Cornwall's mines, in Northern Michigan.

Missouri, Kansas & Texas.—The House Committee on Indian Affairs at Washington reported favorably the bill to allow this company to relocate its line through the Indian Territory. The company proposes to improve its grades, and to remove the track in many places a half mile from the present location to secure better grades. The company is forced to pay to the Indian nations at the usual rate for land occupied in relocating the line.

New Roads.—Engineers are at work between Huntersville, W. Va., and Harmon, the terminus of the West Virginia Central & Pittsburgh road, on a line which, it is

given out, is to form a connection between that road and the Chesapeake & Ohio. The surveys are being made for leading landowners of Pocahontas County, which has important undeveloped coal and timber resources. Most of the land is owned by foreigners, Hon. John T. McGraw, of Grafton, W. Va., being the representative of thousands of acres. The plan is to find a practicable route for a connecting road by way of Huntersville, and to offer such inducements as will cause each road to build from its main line to Huntersville. The landowners living outside of the county have been willingly assessed \$100,000 besides right of way through their lands, and every resident landowner has promised free right of way.

Newtown Creek Terminal.—This company, which was organized in New York a few months ago to build a terminal road in Brooklyn, will soon begin construction. The company is to build a road along the shores of Newtown Creek, in Brooklyn, to carry freight to and from factories and warehouses. The length of the road will not at present exceed three miles. The directors are Theodore R. Chapman, Almet F. Jenks, Frank Bailey, A. W. Waldron, Jr., of Brooklyn; Louis Windmuller, Henry Brookfield, Albert Winter, Clarence F. Levin, of New York, and others.

North Fork Valley & Anthracite.—This company has been organized to build a road to the anthracite coal mines in Gunnison County, Col. The main line will commence at Hotchkiss, in Delta County, and extend northeasterly to the mouth of the North Fork canon and thence to Anthracite creeks in Gunnison County. The directors are Enos T. Hotchkiss, Newton N. Hiestand, George H. Dake, Edward J. Matthews, George H. Merchant, W. A. Clark, J. W. Hurst, J. W. Buzley, W. L. Savage, L. D. Welmont, A. R. Bruce and W. T. Hawkey.

Pecksport Connecting.—Burke Brothers, of Scranton, Pa., have been awarded the contract for the grading and masonry on this road as announced last week, and the work is to be completed in two months. The new line will be about four miles long from a point on the Utica Division of the New York, Ontario & Western to a connection with its main line. Its construction will enable the company to avoid the heavy grade at Eaton Summit, as described last week.

Rumford Falls & Rangeley Lakes.—This road has been formally opened to travel, and the first scheduled train over the road was run on Thursday of last week. The new road extends into the heart of the Rangeley Lake region of Maine, reaching Bemis 28 miles from Rumford Falls, passing through thickly wooded districts. The road is an extension of the Portland & Rumford Falls road.

St. Louis & O'Fallon.—The certificate of incorporation of the company was filed last week. The company proposes to construct a road from East St. Louis to O'Fallon, Ill. The incorporators are Edward L. Thomas, John T. Taylor, William A. Reiss, John Vogt and Ellis Taylor, of Belleville, Ill.

Sandy River.—W. D. Smith, of Bangor, Me., has begun work on his contract to improve the grades and straighten the roadbed of this, a 2-ft. gage road in Maine 18 miles long, from Phillips to Farmington, in the Rangeley Lake region.

Seaboard Air Line.—It is said that this company proposes to build a belt railroad around the city of Charlotte, N. C.

Sherman & Patten.—Work on this road, which is to connect the town of Patten, Me., with the Bangor & Aroostook, is to be resumed in a week.

Southern.—A second track is to be built on that portion of the main line between Greensboro and Charlotte, N. C., 50 miles. Acting President Andrews tells a correspondent of this journal that for some time the present track has been inadequate to properly handle the rapidly growing traffic between these points. Both towns are on the main line between Washington and Atlanta. Greensboro is also the junction of three of the Southern's lines, while Salisbury forms the connecting link between the old main line and the new through line now about to be established via Asheville from Memphis, Tenn.

Spartanburg & Henrietta.—A new road to connect these two Carolina points, the former in South and the latter in North Carolina, is being surveyed. The line is to start from Clifton, S. C., going through Cowpens, S. C., to Henrietta, N. C., the latter a new cotton-manufacturing town, where two large mills are located. It is stated that the Messrs. Simpson will extend the line on their own account to Glenn Springs.

Texas Midland.—Surveyors are now in the field, on the northern extension to Paris, Tex. It is the intention to complete this extension into Paris, Tex., by Sept. 1. Work will be commenced on the line within the next 30 days.

Wheeling Bridge & Terminal Railway Co.—The receivers have settled with those property owners in Benwood, W. Va., whose opposition has delayed the laying of tracks through that town to several large iron and steel mills. The chief opposition to the Terminal Co. was by the Wheeling Iron & Steel Co.

Wilkes-Barre & Northern.—A large force of Lehigh Valley employees last week tore up the newly laid track in Dallas, Pa., and left two cars with the trucks removed on in the disputed territory. The road is being built between Luzerne Borough and Harvey's Lake, through Dallas. John B. Reynolds, who is at the head of the enterprise, expects to have the road completed between Dallas and Luzerne Borough by July 1 and all the way to the lake by September. The road will run parallel to the Lehigh Valley, on the opposite side of a creek, the whole distance. The road is being constructed by the company's forces. The company has the right of way the full distance.

Winona, Black River Falls & Neillsville.—This company, which proposed to build an electric line, about 90 miles in length, extending through southwestern Wisconsin, has decided to build a steam road, and is making a resurvey of its projected line.

Youghiogheny Southern.—It is reported that this reorganized company, with H. C. Frick as the controlling factor, will build a line from the Frick coke plant in the Youghiogheny Valley to a connection with the Union road of the Carnegie Steel Co. at Duquesne. The road will be 40 miles in length, and connect Duquesne with Bradford via the Youghiogheny Valley.

Electric Railroad Construction.

Baltimore, Md.—The Metropolitan Railroad Co., of Baltimore, has been organized with a capital stock of \$2,000,000. Some of the incorporators are: E. Southard

Parker, of Washington, D. C.; A. C. Stevens, of Washington; Charles P. Janney, of Leesburg, Va.; A. S. Bigelow, of Rochester, N. Y.; John T. Collins, of New York, and J. Kemp Bartlett, Jr., and Albert W. Reed, of Baltimore. An ordinance has been introduced in the City Council on behalf of the new company for a franchise for two routes, one running through the business section of the town from east to west, and the other running from Druid Hill Park to Patterson Park by way of Chase and Bolton and other streets, covering in all a distance of about 12 miles.

The Shore Line Electric Railway, which is being constructed by the Traction Co., was opened as far as Kelly's Park, beyond Westport, a distance of 1½ miles, on May 21. The entire extension will be not quite three miles long.

Carlisle, Pa.—The Carlisle electric road will be extended to Barlings Springs, a distance of six miles.

Cleveland, O.—It is said that work will be begun within 60 days on the Cleveland, Wadsworth & Southern Railroad. Beside the road from Cleveland to Wooster a branch will also be extended to Western Star, making a total length of 100 miles.

Hazleton, Pa.—It is proposed to extend the electric road from West Hazleton to Harwood, a distance of nearly two miles. Surveys of the route have been made.

Elizabeth, N. J.—The Elizabeth street railway, which is at present operated by horses, will soon be changed to an electric road.

Jalapa, Mexico.—A large force of men is now employed on the construction of the electric railroad from Jalapa to Cordoba, a distance of 45 miles, which will traverse the coffee country. It is the first railroad of the kind in Mexico.

Milwaukee, Wis.—The franchise of the Milwaukee, Racine & Kenosha Electric Railway Co. for a right of way through to Kenosha and for a local line has been accepted by the company. Work has already been begun on the road from Milwaukee to Chicago.

Niagara Falls, N. Y.—The Niagara Falls & Lewiston Railroad Co. has completed its double-tracked line from Niagara Falls to Lewiston, a distance of seven miles. The cost of construction was \$1,316,000. In one part of the line it required a vertical cut in solid rock of 60 ft. It is one of the most picturesque routes in this country.

Ottawa, Ill.—The Baird Electrical Conduit Co., of Chicago, has asked for a franchise to build four to five miles of electric road in Ottawa.

Philadelphia, Pa.—The power station of the Fairmount Park Transportation Co. will be located in the rear of the Belmont pumping station, at the western end of the Columbia bridge, and the car barn will be built to the westward of the Junction Railroad, a short distance from the power station.

St. John, N. B.—The directors of the St. John Street Railway Co. have decided to build extensions to the park and cemetery.

Sturbridge, Mass.—The contract for building the Southbridge & Sturbridge street railroad has been awarded to the Worcester Construction Co.

Syracuse, N. Y.—The Syracuse Rapid Transit Co. was incorporated on May 21 with a capital stock of \$4,000,000. The company expects to build over 55 miles of road. The directors are: John A. Young, of Jersey City; Edward H. Tobey, of Brooklyn, and Ansel L. White, Samuel B. Lawrence, and others, of New York.

Taunton, Mass.—The Taunton & Brockton Street Railway Co. has been incorporated with a capital stock of \$100,000.

Walkertown, Ont.—The Huron & Ontario Electric Railway Co. propose to build an electric road from Walkertown to Kincardine and Goderich, a distance of nearly 100 miles, and one from Flesherton to Menford, a distance of 25 miles.

Wellington, O.—The Lorain County Commissioners have granted T. Y. McCray, Nelson Ozier, T. R. Martin and B. F. Platt a franchise to build an electric road from the Ashland County line to Wellington, a distance of about eight miles.

GENERAL RAILROAD NEWS.

Mexican Central.—Messrs. E. Rollins Morse & Bro., bankers of Boston, have negotiated a sale of \$800,000 of this company's four per cent. bonds to a syndicate of bankers. This, in connection with the \$1,000,000 bonds sold last year, furnishes all the money required by the company for present contemplated improvements. The \$1,000,000 bonds sold last year were for the construction of the branch to Ameca, 55 miles, the cost of which will not exceed \$1,000,000. The bonds sold last year and now were treasury bonds issued on the old mileage, and there is still between \$300,000 and \$400,000 in the treasury. When the Ameca branch is completed the company will be authorized to issue bonds to the extent of \$82,000 a mile. These bonds will go into the treasury.

Port Royal & Augusta.—The decree filed last week by Judge Simonton, of the United States Circuit Court, at Charleston, S. C., ordering the sale of this property at a date not set, has since been withdrawn by the judge at the request of a number of parties interested in the case.

St. Joseph & Grand Island Plan.—At a meeting of the holders of the Central Trust Company's certificates of deposit for first mortgage bonds of the company, held in New York last week, the committee submitted a plan of reorganization, which was adopted by a vote of over two-thirds in interest. The plan provides for the issue of \$1,000,000 first mortgage gold bonds, \$5,500,000 first preferred, \$3,500,000 second preferred, and \$4,600,000 common stock.

Southern.—The company reports earnings for April and the 10 months as follows:

	1895.	1895.	1894.
Gross earn.	\$1,383,097	\$1,403,744	\$1,366,320
Oper. exp. and taxes.	1,069,572	1,119,371	1,149,671
Net earn.	\$313,525	\$284,373	\$216,649
Prop. exp. to earn.	705	794	814
Net 10 mos.	5,162,320	4,766,270	4,681,763

Western Maryland.—The Western Maryland & Tidewater railroad project has been revived in Baltimore. In seeking to extend its street railroad lines "up town" from the eastern terminus, the Central Railway Company asked for a franchise through Alicanna street. This was part of the right of way granted to the Western Maryland in 1890 for its tidewater terminal, and President Hood, on May 18, obtained a permit and proceeded

to lay tracks on the street in question. President Hood has announced that the proposed extension of the Western Maryland to the water front was checked by the financial stringency which followed the Baring failure, but has not been abandoned. He states that the line will be built unless considerable abatements from the present trackage charges can be obtained. The tracks in Alicanna street were laid simply to protect the right of way, and they will be used for the time being in the freight transfer system of the Philadelphia, Wilmington & Baltimore road, being operated from President Street Station. On May 1, 1875, an agreement was entered into between the Western Maryland and the Pennsylvania Railroad Companies permitting the former to bring its trains into Union Station through the Baltimore & Potomac tunnel. For this privilege the Western Maryland was to pay 10 cents for each trip passenger carried, and six cents and four cents each, respectively, for persons traveling on excursion or commutation tickets. A regular schedule of freight tonnage charges also was arranged, and the Western Maryland pays annually about \$80,000 fixed charges for getting its trains from Arlington to Hillen Station, a distance of less than 10 miles. A part of this drain on the company's revenues was removed in 1895 when the Walbrook Station was built west of the tunnel, and an arrangement was effected with the City & Suburban Street Railroad Company to bring passengers into the city. The tidewater terminal was projected in 1889 to make the Western Maryland independent of its competitors. In 1890 special legislation was enacted by the Maryland Legislature, and ordinances were passed by the Baltimore City Council granting the right of way through the city. The route as then established left the Western Maryland main line at Arlington station and proceeded eastward to Jones' Falls; thence down the valley, past Union Station, to a point near Hillen Station. From there an elevated structure was to carry the tracks over the bed of the stream, through the heart of the city, to Eastern avenue, whence surface tracks would convey trains to President Street Station and eastward to Canton, where extensive docks and wharf privileges were available.

Electric Railroad News.

Birmingham, Ala.—After much delay cars are running at regular intervals on the East Lake line. The formal opening of the road was on May 1; the new motors were only delivered last week, which was the cause of the delay in adopting a regular schedule.

Duluth, Minn.—A controlling interest in the Minnesota Point Street Railway was sold on May 19 to H. O. Underwood, of Boston, and Dunn Bros., of Philadelphia. The amount paid has not been made public. G. A. Leland will be President and Superintendent. Many improvements will be made and the road will be made into an electric line.

Hamden, Conn.—The New Haven Street Railway Co. opened its new line between Whitneyville and Hamden on May 23.

Rockville, Md.—The Tenallytown & Rockville Electric Railroad has been sold to O. T. Crosby, who was acting for the Georgetown & Tenallytown Electric Railroad Co., for \$36,500, including franchise, track, cars, equipment and real estate.

Toledo, O.—Negotiations are now pending in New York for the joint ownership of the Toledo Traction Stock Co. and the Toledo Electric Street Railway Co.'s stock.

Staton Island, N. Y.—Erastus Wiman, on May 23, purchased at foreclosure sale the property of the Electric Power Co. at Staton Island for \$110,000.

TRAFFIC.

Traffic Notes.

The Interstate Commerce Commission is to give a hearing at Kansas City, June 5, on the complaints of the grain shippers of Kansas.

A bill to compel the establishment of uniform freight classification on or before March 1, 1897, has been favorably reported by the committee to the United States Senate.

The whaleback steamer Joseph R. Colby has been chartered to take 5,500 tons of coal from Philadelphia to Montreal, carrying 1,500 tons in her hold and 4,000 tons in three whaleback barges which she will tow.

The Pacific Express Company now takes freight through from New York to Houston, Tex., in 63 hours, about 17 hours less than the best time heretofore made between those cities.

The Baltimore & Ohio has put on a fast freight train to run from Baltimore to Chicago, St. Louis and Louisville, the time being fifty hours to each city.

The Chicago stock yards case, involving the \$2 switching charge, recently decided by the Circuit Court of Appeals in favor of the railroads, has been taken to the United States Supreme Court, where a petition was presented on May 25, asking that court to take jurisdiction.

As heretofore noted, the New York Produce Exchange is preparing to enter a complaint before either the Interstate Commerce Commission or the State Railroad Commission, concerning alleged unjust freight rates from the West to New York City. It is now given out that one of the grounds on which the grievances of the Exchange are based is the rate charged by the railroads for storing flour. The new rules provide that storage at New York shall not begin on flour covered by through bills of lading for 60 days after the date of the bill of lading—in other words, after the date of shipment from the initial point. As it takes only about 10 days to bring the flour to New York, there still remains a free storage right for the through flour of 50 days, against 20 days' storage of flour consigned to New York parties. The representative of the Exchange avers that this condition of affairs will drive the local export trade from New York; that the railroads are not discriminating in favor of other ports, but in favor of themselves as through freight agents. In other words, they acknowledge that 30 days' free storage is not sufficient to obtain ocean freight accommodation for themselves, but they compel the local merchants to operate on that basis. When the railroad issues a through bill of lading it names a lump sum from the point of shipment to the foreign port of destination. Under the terms of the Joint Traffic agreement such a lump sum must be equal to the full rate, plus the actual ocean freight rate. As, however, the ocean freight rates are constantly fluctuating, the long-storage privilege accorded to through flour gives it a distinct advantage

over the local flour, as the railroads are in a position to wait for a favorable opportunity to ship. It is thus evident, it is claimed, that the railroad people are encouraging through business at the expense of New York's local export business.

Interstate Commerce Commission.

The Interstate Commerce Commission, in an opinion by Commissioner Yeomans, has announced its decision of the case of the Johnston-Larimer Dry Goods Company, of Wichita, against the Atchison, Topeka & Santa Fe and others, in favor of the complainant. The rates for the transportation of cotton piece goods, molasses, sugar, rice and coffee from Galveston and Houston, Tex., to Wichita, which are higher than rates on said commodities from the same point of shipment to Kansas City and other "Missouri River points," are held to be to the unreasonable disadvantage of complainant. It is further held that such higher rates to Wichita than to Kansas City over the Atchison, Topeka & Santa Fe and the Chicago, Rock Island & Pacific are in contravention of the fourth section of the act to regulate commerce.

Defendants are required to correct their methods of announcing rates, changes in rates, and exceptions to rate sheets by participating lines, so that their rate schedules will be readily intelligible to shippers and consignees.

The Joint Traffic Association.

Mr. J. S. Leeds, Traffic Manager of the Business Men's League of St. Louis, has been to New York to present to the Managers of the Joint Traffic Association the request of the merchants of St. Louis that the railroads absorb the bridge arbitrary across the Mississippi River at that city.

The Board of Managers has agreed that the New York, Ontario & Western shall have on westbound freight the following differentials below the standard rates to Chicago, rates to other points being made on the usual proportionate basis: 6, 5, 4, 3, 2, 2. This decision was reached on the request of the road for rates to enable it to meet the competition of the National Dispatch.

A Western paper says that the Board of Managers has given in to the Western roads in the dispute over the issue of joint-rate sheets. The Managers demanded that all rate sheets quoting rates applicable to Eastern territory should first be submitted for their approval before being put into effect. The Western roads made a vigorous protest and the Managers have made up their minds that they will allow the rate sheets to be issued as before.

The Board of Managers has decided on new regulations for lighterage deliveries and terminal charges of the harbor of New York, taking effect June 1. The present rules as to free lighterage will continue, but the charge for lighterage otherwise than in carloads within the lighterage limits will be 3 cts. per 100 lbs., and the minimum charge will be \$6 for each separate delivery. Demurrage will be \$6 a day on lots of 50 tons and under on any one lighter or barge, and \$10 a day on lots of over 50 tons. Not less than \$15 a day or fraction of a day will be charged for detention of floats beyond 48 hours.

Chicago Traffic Matters.

CHICAGO, May 27, 1896.

The Joint Traffic Association and the roads west of Chicago are at loggerheads over rates on wool. The Soo Line, in connection with the Canadian Pacific, has put in a 44-cent rate on wool from St. Paul to the seaboard. The Chicago-St. Paul roads desired to meet this, via Chicago, but their Eastern connections have refused to join them. The lake lines have also refused to participate in a reduced tariff. The Western roads want the Eastern lines to accept 27 cents as their proportion of the New York rate, but they demand 33. The Board of Managers has requested Chairman Midgley to use his best efforts to have the Soo advance its wool rates before the Chicago roads reduce. This Mr. Midgley says is out of the question.

The trouble started by the Chicago Great Western has been temporarily settled. The reduced rates are canceled, restoring all rates on May 31. The Northwestern roads, however, have united with the Chicago Great Western to oppose any differential rates by the Car Ferry line. The Soo, the Car Ferry's Northwestern outlet, has promised that it will refuse to join in any rates lower than those over the all-rate lines; but the Car Ferry Company says it will take a differential.

The Wisconsin Central has given notice that it will abolish the charges on bicycles, tricycles and baby carriages on June 1. The bicycle agreement of the Western roads is incorporated in that of the Western Passenger Association. The latter has refused to recognize the Wisconsin Central's notice, and the latter has appealed to Chairman Caldwell for privilege to waive the charges. The Chairman has refused the appeal, but the trouble will probably be patched up.

The old case of the Interstate Commerce Commission against J. W. Reinhart, J. A. Hanley and several Chicago shippers, for giving and receiving illegal rebates, has been continued in the United States Circuit Court until the October term. The prosecution intimated that the defense was keeping the principal Government witnesses in hiding. Ex-President Reinhart proclaims himself innocent of all charges made by the Government.

Total shipments from Chicago to the East by lake last week amounted to 68,549 tons. Total rail shipments, exclusive of live stock, amounted to 49,305 tons, compared with 50,794 tons for the preceding week, a decrease of 1,489 tons, and against 47,213 tons for the corresponding week of last year. The proportions of the all-rail shipments carried by each road were:

Roads.	WEEK TO MAY. 23.		WEEK TO MAY 16.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central.....	3,578	7.3	3,675	7.2
Wabash.....	5,732	11.6	4,943	9.7
Lake Shore & Mich. South.....	7,433	15.1	7,363	14.5
Pitts., Ft. Wayne & Chicago.....	5,943	12.0	6,512	12.8
Pitts., Cin., Chi. & St. Louis.....	6,311	12.8	6,905	13.6
Baltimore & Ohio.....	4,045	8.2	4,688	9.2
Chicago & Grand Trunk.....	6,018	12.2	4,948	9.8
New York, Chic. & St. Louis.....	3,800	7.7	4,413	8.7
Erie.....	4,317	8.8	4,898	9.7
C., C. & St. Louis.....	2,138	4.3	2,451	4.8
Totals.....	49,305	100.0	50,794	100.0

Of the above shipments 2,387 tons were flour, 16,953 tons grain and millstuff, 9,168 tons provisions, 9,690 tons dressed beef, 2,417 tons butter, 1,438 tons hides and 4,851 tons lumber.